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Telegrams: LANCET, RAND, LONDON. Telephone: TEMPLE BAR 7228 and 7229.

No. X., OF VOL. II., 1937. LONDON, SATURDAY, SEPTEMBER 4, 1937. Pp. 120—Price 1s.
No. 5949. VOL. CCXXXIII. Founded 1823. PUBLISHED WEEKLY. Registered as a newspaper. Annual Subscription: Inland £2 2s. Abroad £2 10s.

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No. 5949 LONDON: SATURDAY, SEPTEMBER 4, 1937 CCXXXIII

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THE PATHWAYS AND RELIEF OF PAIN IN ADVANCED CARCINOMA OF THE CERVIX UTERI

By T. F. Todd, M.S. Lond., F.R.C.S. Eng., M.C.O.G.

HONORARY ASSISTANT GYNÆCOLOGIST TO THE SALFORD ROYAL HOSPITAL; RESEARCH FELLOW AT THE CHRISTIE HOSPITAL AND HOLT RADIUM INSTITUTE, MANCHESTER

Pain and cancer are in a large measure synonymous to the uneducated lay mind, and with some justification, for as Trotter (1921) points out, in most cases of cancer pain is characteristically absent in the earlier stages, and present only at a period when successful treatment is doubtful or impossible. Assuredly cancer would be less dreaded if the pain factor became minimal. Carcinoma of the cervix, treated no less than untreated, is as often associated with severe pain as is malignancy elsewhere, and in view of its frequency the problem of relieving this pain is of major importance. The sufferer cries out for relief irrespective of the cause of the pain, and when the pain is due to malignant disease, only too often opiates are resorted to, with the establishment of morphinism and its distressing finale. It is one of our duties as a profession to find some equally effective method of relieving pain without producing these sequelæ. In cases of carcinoma of the cervix with severe pain it has been found possible to do this by means of therapeutic methods directed at interrupting the afferent pathway concerned.

John Hilton, in his lectures on rest and pain (1877), stated that "every pain has its distinct and pregnant signification, if we will but carefully search for it." This aphorism is strikingly borne out when cases of carcinoma of the cervix are studied. Broadly speaking there are two main types of pain found, visceral and somatic. The former is more common in treated cases, being often associated with necroses or late radiation reactions. The latter is more prone to occur in neglected and untreated cases. The clinical problem consists in the recognition of the precise type of pain, since different afferent pathways transmit the painful impulses, and therapeutic measures to be successful must be directed to the pathway concerned in each individual case. In the present research 33 cases of intractable pain have been investigated, and my purport is to demonstrate that rational and appropriate methods of therapy give very satisfactory results. I will endeavour to show that the most important point is accurate diagnosis of the type of pain—i.e., whether it is visceral or somatic in nature. Briefly, visceral pain is pain that is limited to the lower abdomen and pelvis, and is typically diffuse; it is invariably associated with a recognisable lesion in one of the pelvic viscera, and the afferent path concerned is the sympathetic. Somatic pain is experienced in the thigh and leg, in the distribution of the lumbosacral nerves; it is unassociated with any visceral lesion and the afferent path concerned is the ordinary somatic one. Occasionally both forms of pain occur in the same patient. These two types of pain are quite distinct in symptomatology, ætiology, and appropriate methods of therapy, and in consequence a distinction between them is of fundamental importance. They become two separate studies.

ASSESSING THE SEVERITY OF THE PAIN

The most difficult single factor to be contended with by the physician is to judge how severe the pain is, and it is essential to have some criteria whereby cases can be graded and compared. Wilfred Harris (1934) appositely remarks:

> "Pain cannot be accurately measured or estimated as its intensity and severity of perception by any given individual can only be demonstrated to other witnesses either by a description in the language of the patient, or by his obvious reactions to pain. . . . One rough criterion is the readiness with which patients agree to the drastic treatments of nerve injection or resection."

The criteria of which I have made constant use are two: (1) the pain is severe enough to prevent the patient sleeping, and (2) the patient is willing to submit without question to any therapeutic measure suggested. By this simple and arbitrary, though incomplete, method of assessment I have been able to sort out the severest cases only for treatment by methods that I shall later describe.

Before attempting to treat severe pain accompanying pelvic malignancy it is essential to diagnose the type of pain, since different afferent paths are concerned—i.e., sympathetic and somatic. This involves a careful clinical investigation, largely eliminatory. First, the subjective phenomena must be inquired into in detail as it is important to know the type, severity, and situation of the pain, as well as its duration, frequency, paths of reference, special times of occurrence, and the presence of aggravating and/or relieving factors (Ryle 1936). Secondly, the state of affairs in the pelvis must be known—digital examination reveals the condition of the uterus and parametria, a sound introduced into the uterus excludes a pyometra, and cystoscopy and sigmoidoscopy demonstrate the presence or absence of any involvement of bladder or rectum by growth, or the presence of any late radiation reaction. The possibility of secondary hydronephrosis must be considered and excluded; a blood count shows whether or not there is a leucocytosis—possibly associated with an infective focus in the pelvis; an X ray of the pelvic bones will exclude any bone metastases—rarely seen in practice. Thirdly, a neurological examination is made, searching for any objective signs. These are usually absent in these cases, or sometimes possibly obscured by the presence of a concomitant swelling of the limb, due to intrapelvic vascular obstruction. The distribution of the pain must be detailed to the nerve-roots concerned—the subjective phenomena suffice for this. Head (1893), who first accurately mapped out the segmental skin sensory innervation, pointed out that the localisation of sensation is not a physical but a psychical phenomenon. Lastly, it must be borne in mind that the presence of severe pain for any length of time produces considerable changes in a patient's mental state, and it is essential to estimate the patient's psychological condition, both as regards assessment of the severity of the pain, and even more in evaluation of the results of treatment.

PELVIC AFFERENT PATHWAYS

In order to clarify the subsequent argument it is advisable to include a brief résumé of the possible afferent pathways that may be involved in pelvic lesions. There are two possible routes for transmission of sensory impulses to the sensorium—by the

autonomic nerves and by the peripheral nerves. This anatomical difference coincides with the clinical variations in the type of pain, and materially affects the methods of therapy.

The *autonomic nerves* in the pelvis are derived from connector cells in the 1st and 2nd lumbar segments (sympathetic) and in the 2nd and 3rd sacral segments (parasympathetic). The sympathetic connector fibres form the presacral nerve which passes to the inferior hypogastric ganglia on the lateral walls of the rectum. The parasympathetic connector fibres form a single nerve on each side, the nervus erigens, which proceeds also to the inferior hypogastric ganglion. That afferent fibres are present in the presacral nerve is beyond dispute; Davis (1933) estimates that the proportion is approximately a third. Their presence in the nervi erigentes is still disputed. From the point of view of the surgeon this is fortunate, since section of the afferent sympathetic path is simple, whereas the parasympathetic path is relatively inaccessible in the living.

The *peripheral nerves* traversing the pelvis are also limited in number: in the false pelvis there are the femoral, genito-femoral, and lateral cutaneous nerves; and in the true pelvis there are the obturator, the fifth lumbar nerve, all the sacral nerves, the pudic nerve, and the coccygeal nerve. The only nerve derived from the upper lumbar roots to traverse the true pelvis is the obturator, which runs along the inferior border of the psoas just anterosuperior to the 5th lumbar nerve. All these nerves contain afferent fibres. The nerve-roots that may be involved extend from the 1st lumbar to the coccygeal.

ÆTIOLOGY

Careful clinical examination and investigation will differentiate pelvic visceral pain from somatic limb pain. In the cases of visceral pain the ætiology is bound up with a recognisable lesion in a viscus, such as malignant or radio-necrotic ulceration, or the retention of blood or pus under pressure. There is some dispute as to the exact cause of the pain—e.g., whether it is due to surface irritation of nerve-endings exposed in the ulcer, to the degree of tension in the viscus, or to the accompanying ischæmia present in every case. The theoretical problems concerned are adequately discussed by Morley (1931) and Ryle (1936) and I do not propose to discuss them further now.

The ætiology of the somatic type of pain is quite uncertain in these cases but this does not prevent an erroneous conception being transmitted from one text-book or authority to another. Lavedan (1935), Greenhill and Schmitz (1935), and Balme (1936), among many others, state that the limb pain associated with advanced pelvic malignancy is due to the invasion of the nerve trunks by tumour cells, or their compression by neoplastic masses. Greenhill and Schmitz go so far as to say the pain is due to the "fact" that the sensory nerves become involved in the malignant growth—the strange exemption of the motor nerves from this process escapes comment! In actual practice, in my experience, it is the exception rather than the rule for the lumbosacral nerves to be concerned in the pain distribution; the upper lumbar roots are far more commonly involved, and the only nerve having origin from these roots and traversing the pelvis is the obturator, and pain in the obturator nerve distribution is very unusual. I have not yet seen macroscopic evidence of compression of nerves by growth at autopsy, and in three cases where I have examined the lumbosacral nerves microscopically, evidence of pressure or invasion was equally lacking.

There are several other quite convincing arguments against the assumption of pressure as the chief cause: the rarity of any recognisable neurological signs is not in accordance with our findings in cases of known compression of somatic nerves; the absence of any appreciable parametrial induration in many cases is hardly compatible with pressure from malignant masses; and the existence of numerous cases with bilateral parametrial solidity (the so-called "frozen" pelvis) unassociated with any pain whatever. All these tend to discredit a theory that is popular because it is so easily comprehended. It is interesting to note that the only objective phenomena that have been demonstrated are compatible with a nerve-root lesion rather than a trunk one. Another common assumption should, I think, also be discarded—namely, that the pain is due to metastases in the pelvic bones. In not one of my cases has there been any radiographic evidence of bone metastases, and from a very large experience Hurdon (1937) states that such metastases are extremely rare.

The possibility of these cases being examples not of direct but of referred pain must be next considered. The absence of a visceral lesion, the type and unilateral distribution of the pain, and in particular its usual root distribution—most cases (as will be shown later) being distributed between lumbar 2 and sacral 2 where there is no autonomic inflow or egress—all tend to disprove this possibility. Added proof is given by the relief that follows epidural injections, and the failure of sympathectomy in this type of case.

We are left with the alternative possibilities of functional pain and somatic pain. Functional pain can only be diagnosed by a process of exclusion, and unquestionably in a large number of these cases there is a superimposed functional element once the pain has persisted for any length of time. (I think this partly explains some of the failures after intrathecal injection of alcohol.) The bulk of the evidence supports the conception of the pain as somatic, by which is meant merely that it arises from some lesion in the distribution of the peripheral nervous paths and is correspondingly appreciated. Possible sites of origin of the pain are the peripheral nerve-endings, the cutaneous nerves, the nerve trunks, and the nerve-roots. The first two can be excluded in the absence of any recognisable peripheral lesions; the third is the generally accepted cause; and the fourth is the one I am postulating. The arguments against the pain being due to involvement of the nerve trunks have already been detailed, but the possibility of an infective process has not been excluded—the majority of parametrial infiltrations are inflammatory—and the possibility of a neuritis of the trunks traversing the pelvis is quite real, but in view of the clinical picture actually found and the absence of any histological proof it is, at any rate, unlikely to be common. It is noteworthy that similar limb pain is exceptional in cases of parametritis where the most massive parametrial solidity is found. This leads us to the fourth possibility—namely, a root origin. The clinical picture is not that of a trunk neuritis, but rather resembles a root lesion in the few cases where objective phenomena have been present—e.g., hyperæsthesiæ, ill-defined pareses, and some wasting of muscle groups—although admittedly such signs are uncommon. The nerve-roots involved are mostly not those belonging to the nerves connected with the pelvic lesion, and this would seem to force us to postulate some remote lesion rather than a proximate one, and I suggest, tentatively, something in the nature of a radiculitis. Histologically there is no definite evidence of this although the spinal cords I have examined microscopically have all shown excessive hyperæmia of the vessels around the roots and in the substance of the cord adjacent. Granted the existence of an inflammatory focus in the pelvis

—and this is usual with cervical cancer—an inflammatory root lesion could occur either as a metastatic process or as a result of the direct spread of infection via the perineural lymphatics. Since the nature of the actual lesion has to be demonstrated first, such conjectures are at present premature. The absence of any definite histological lesion does not necessarily exclude a radiculitis. Therapeutically the success attending methods aimed at interrupting the afferent pathway at the level of the nerve-roots does not disprove the possibility of a more peripheral origin of the pain, and it would be necessary to interrupt the nerve trunks without giving relief in order to prove that the pain was arising higher: unfortunately this is impracticable.

The arguments in favour of some such nerve-root lesion in brief are: (1) the clinical picture, if anything, is that of a root lesion; (2) the roots affected are usually those remote from the trunks related to the pelvic lesion; (3) the histological findings are equivocal, but not necessarily contrary; and (4) therapeutic methods applied to the roots are strikingly successful. The success of such therapy does, at all events, prove that the cause of the pain is distal to the posterior nerve-root ganglia. For the present such a theory provides, at all events, a useful working hypothesis.

DIAGNOSIS AND TREATMENT

The clinical problem must now be discussed. It will be seen from the foregoing argument that the essential preliminary to rational therapy is accurate diagnosis of the type of pain, inasmuch as two distinct afferent pathways are concerned. An attempt will be made to indicate how this may be achieved.

Visceral pelvic pain may be described briefly as one of inexact localisation and, sometimes, diffuse radiation, with no objective neurological signs, but with a recognisable lesion in an appropriate viscus. The pain is bursting or spasmodic, and is usually intermittent with frequent colicky exacerbations. It tends to be provoked by functioning of the affected viscus—e.g., after evacuation of the bladder or rectum. It has no exact topographical landmarks, but is experienced as a deep rather than a superficial sensation. The pain is commonly described as "bearing down," especially by the parous patient, and, curiously, even when the visceral lesion is extra-uterine. In the severer cases radiation to the thighs is not infrequent, and without care confusion may occur with somatic pain: radiated visceral pain is, however, nearly always bilateral, and the localisation is fairly constant to the front and upper part of the thighs. In most cases the diagnosis can be made on the subjective phenomena alone, but in all it should be confirmed by careful clinical and neurological examination.

Once the visceral nature of the pain is definitely decided the treatment becomes fairly straightforward—there are two alternatives, either to section the afferent pathway or to operate directly on the viscus concerned. The method to be adopted depends to a certain extent on the particular type of lesion, as I hope to show in the cases to be described. In all cases sympathectomy would suffice and would probably be the sole treatment adopted were there not other factors of themselves demanding local treatment. In practice I think that sympathectomy should be reserved to those cases where it is not possible to deal directly with the visceral lesion.

I have treated 15 cases of severe visceral pelvic pain to date. In 4, relief of pain was obtained by direct methods, while in 11 it was necessary to carry out presacral neurectomy. The first four cases were briefly: (1) Rectal pain and tenesmus associated with ulceration and stenosis; here a colostomy produced relief. (2) Necrosis of uterine wall following gross over-dosage with intra-uterine radium in the treatment of menorrhagia; relief followed panhysterectomy. (3) and (4) Severe bearing-down pains ensuing five and eighteen months respectively after treatment of a cervical and a body growth; in each case evacuation of the pyometra that had developed was sufficient to give relief.

Relief by presacral neurectomy of severe pelvic neuralgia associated with advanced carcinoma of the cervix has been reported by Cotte (1932), Bernard and Theodorescu (1928), Behney (1935), Jung and Lucinescu (1934), de Grisogond (1929), and Paolucci (1928), among others. In the present series of 11 cases, presacral neurectomy was carried out 5 times for the pain associated with a chronic rectal reaction (in which cases it was also hoped that the increased vascularity resulting would accelerate the healing process), 4 times for advancing malignancy involving the bladder and causing extreme dysuria, and in 2 cases where no precise visceral lesion had as yet developed, but the clinical picture was that of visceral pain with extensive gland metastasis, and sympathectomy relieved it. In every case so far the results have been most striking, being immediate in their onset and more or less permanent in their effect. There has been no operative mortality in these 11 cases though they were mostly poor subjects, and the results have been so gratifying that I think the operation is now justified in less advanced malignancy once definite visceral pain has developed.

A number of failures following sympathectomy have been reported, and to a certain extent the operation has fallen into disrepute. I think the reason for this is that the wrong type of case has been operated upon; if sympathectomy is carried out on a case of somatic pain it will necessarily fail, for the sympathetic path is concerned with visceral pain alone. Another cause of failure is incomplete division of the nerve, or more correctly, plexus; this also is common. When carried out on the right type of case the operation is as successful as any in surgery. The only complication I have seen following it was a transient incontinence of urine and fæces. The only argument I can see against its performance is the possible effect of the increased vascularity expediting the growth of the tumour; it is diametrically opposite to the old treatment of starvation ligature, where deprivation of the blood-supply to the malignant growth was used to arrest its progress.

Somatic limb pain may be described briefly as pain experienced fairly exactly in the distribution of one or more spinal nerves, and due to stimulation of the respective afferent pathway at some point between the sensorium and the peripheral sensory end-organs. It is accurately localised—in striking contrast to visceral pain—and is of a shooting, stabbing, or throbbing type: it is frequently likened to the neuralgic pain of toothache in these cases. It is more or less continuous, with periods of exacerbation mostly either at night or after movement. Objective neurological signs are not infrequently found. The most common (in the cases associated with advanced pelvic malignancy) is hyperæsthesia of the skin in the distribution of the pain—often there is an appreciable tenderness of the underlying muscles similar to the condition found in the anterior abdominal wall in association with acute inflammatory conditions in the abdomen.

All of the 18 cases of somatic limb pain investigated so far were associated with advanced carcinoma of the cervix which had been treated by means of irradiation, and all fulfilled the arbitrary criteria of severity previously outlined. When each case was examined I made a note of the nerve-roots corresponding to the distribution of the pain, and the Table shows the results. It will be seen that no less than two-thirds

Table showing Root Value of Somatic Limb Pain
(18 *Cases*)

Root value.	No. of cases.	Root value.	No. of cases.	Root value.	No. of cases.
L. 1.	1	L. 2–4.	2	S. 1, 2.	1
L. 1–3.	6	L. 2–5	1	S. 1–3.	1
L. 1–S. 2.	1	L. 2–S. 2.	1	S. 2, 3.	1
L. 2, 3.	1	L. 2–S. 4.	1	S. 3, 4.	1

of the cases are in the distribution of the lumbar roots only, which is contrary to the generally accepted view that the severe limb pain associated with advanced pelvic malignancy has its origin in the sciatic nerve. In my experience it has been the exception rather than the rule for a sciatic root distribution to occur.

As stated, objective neurological signs were not frequent; most common was the presence of definite hypersensitivity to pain stimuli in the involved root distribution, or part of it, in 7 cases: deep pressure causing quite severe pain in the affected areas. In 5 of these cases there was recognisable paresis of the muscle groups supplied by the affected roots, and in 2 others this paresis was accompanied by limited areas of anæsthesia extending over the whole of one lower limb, up to the upper lumbar region behind, and the 10th dorsal level in front. In 13 cases the parametrium on the affected side was infiltrated to the pelvic wall, but in the other 5 cases, although appreciably involved in all, the induration stopped short of the pelvic wall, and, presumably, in these instances the peripheral nerves could not be subjected to pressure as they traversed the pelvis. A radiogram of the lower lumbar spine and pelvis was taken in every case, but never demonstrated any bone metastases. At autopsy 3 cases did not show either macroscopic or microscopic involvement of the nerve trunks traversing the pelvic cavity. Leucocytosis has been present in some of the cases, but usually in association with an inflammatory reaction in the pelvis. In all cases cystoscopic and proctoscopic examination failed to reveal any visceral lesion that might have caused pain, and ureteral obstruction or pyometra were also excluded.

In the light of these clinical observations, the assumption that this type of pain was due to bone metastases or pressure on the lumbosacral plexus appears largely incorrect, and has an important bearing on the therapeutic measures to be adopted. If either of these were causal, the obvious method of treatment would be by deep X ray therapy which, empirically, has been found of temporary value; but if we are dealing with some lesion of the peripheral nerves or their roots then different measures are required. This led me in the first instance to treat these cases by means of epidural injections of novocain and saline, with quite satisfactory immediate results in the majority, but recurrence of pain within six to eight weeks in most. There are two other ways of interrupting the afferent path—namely, by cordotomy and intrathecal alcoholisation of the affected roots. Learmonth (1935) considers surgery is justifiable in those cases where the operation risk is reasonable and where the expectation of life is compatible with that risk. I know of several such cases successfully operated upon on the Continent, but few of our cases would fulfil his first requirement. Intrathecal alcoholisation is a method of treatment which was introduced by Dogliotti (1931), and has been elaborated by numerous workers since, chiefly American. The method is relatively minor and apparently safe; it has given satisfactory results in the majority of the reported cases (Stern 1934, Depuy 1935, Saltzstein 1934, Greenhill and Schmitz 1935, Russell 1936), provided that precautions are taken not to affect the sacral roots, whence arise bladder disturbances (Ewer 1935). In view of the reported successes I was stimulated to give the method a fair trial and I can report on 24 injections given to 18 patients.

TECHNIQUE OF SUBARACHNOID ALCOHOL INJECTION

It is inadvisable to give any premedication, lest the immediate effects of the injection should be obscured.

The patient is placed on the side opposite to that on which most of the pain is felt. The bed is blocked at the foot, one or more pillows being placed under the pelvis to elevate the sacral and lumbar spine. The back is arched and the body turned somewhat ventrally. By placing the patient in this attitude we raise the sacrolumbar region of the spine to the highest level, and simultaneously make the posterior sensory nerve-roots lie horizontally, while the anterior motor roots come to lie in a plane usually out of reach of the alcohol. Even if this latter precaution is not taken the motor roots are not often affected because sensory nerves are more susceptible than motor to the effects of alcohol.

The injection is made with an ordinary lumbar puncture needle introduced into one of the upper lumbar spaces, necessarily above the highest affected root. Once the needle is in the subarachnoid space, 0·5–1 c.cm. of absolute alcohol is slowly injected, about two minutes being taken in all; in most cases 0·5–0·6 c.cm. suffices. The alcohol arises immediately to surround the posterior roots because its specific gravity is about 0·8 whereas that of the spinal fluid is about 1·007. No attempt should be made to draw spinal fluid into the syringe to mix with the alcohol since this is exactly what is not wanted.

Following the injection the patient is kept on the same side for at least an hour to allow the alcohol to fix, and the bed is better left blocked for several hours.

If required, an injection can be given on the opposite side after a few days' interval.

RESULTS WITH INTRATHECAL ALCOHOL INJECTIONS

The 18 cases I have treated were all advanced cervical carcinomas which had been previously treated by irradiation.

The first case was treated over eighteen months, and the last case reported here four months, ago. In all, 24 injections have been given. In 2 cases a successful first injection had to be repeated after an interval of three months. Of the original 18 injections, 4 were not successful; one of these patients refused to have a further injection, but in the other three the treatment was repeated with successful results, the relief lasting six, ten, and four months.

The maximum period of relief so far has been sixteen months. The average duration of relief up to date has been approximately five months per case per injection—and this in spite of 4 cases dying from their growths within one month of injection. Clinically the most striking effect of the injections is the immediate relief that follows the first few minims injected. The only untoward symptoms experienced are numbness and tingling for a few moments, followed by transient anæsthesia and paresis in the affected limb and rarely, if precautions are taken to avoid the alcohol affecting the sacral roots, bladder and rectal difficulties.

The sole complications observed have been retention of urine and incontinence of fæces in two cases, clearing up spontaneously in 48 hours; transient incontinence of fæces alone in another case; and a meningeal reaction in one other case, subsiding spontaneously in four days. No late ill effects of injection have been observed as yet.

An autopsy has been made on 3 of the cases which died of advancing malignancy. The findings (Dr. W. Susman) were:

Extreme congestion of the vessels around the nerve-roots and throughout the lower part of the spinal cord, with gross thickening and hyalinisation of the vessel walls, and some perivascular deposition of hyaline fibrous tissue. In one case dying ten days after the injection there were many small punctate hæmorrhages in both white and grey matter at the level of the injection—possibly due to the irritant action of the alcohol on the nervous tissue, or to trauma at the time of injection.

The demyelinisation and posterior column degeneration reported by Ritchie Russell (1937) were not detected, but in my cases the autopsies were performed within four months of initial injection at the latest, whereas in Russell's 2 cases, twelve and nineteen months had elapsed. Clinically Russell reports a case injected on both sides over two years ago and showing no evidence of progressive degeneration in the cord. It appears therefore, from the little evidence at present available, that these injections do not produce any gross permanent change.

SUMMARY

(1) The nature of the pain associated with advanced carcinoma of the cervix uteri has been described in detail.

(2) Two distinct types occur, visceral and somatic pain, with differing causation, and two quite distinct methods of appropriate therapy—namely, visceral pain requiring presacral sympathectomy, and somatic pain requiring intrathecal alcoholisation.

(3) The importance of accurate assessment of each case before treatment is stressed in order to prevent these methods of treatment becoming discredited through being applied to the wrong type.

(4) A series of 33 cases have been investigated, 15 of visceral and 18 of somatic pain, and in 1 case only did the appropriate therapy fail to give relief.

(5) The adoption of such rational methods of therapy should make it possible to dispense almost entirely with opiates in the terminal phases of uterine malignancy.

The research is being continued in particular with regard to the cause of the limb pain, and in study of any late effects of intrathecal injections of alcohol.

This work has been carried out in connexion with a research fellowship at the Christie Hospital and Holt Radium Institute, Manchester. I wish to express my deep appreciation to Prof. E. D. Telford and Dr. Ralston Paterson, who have sponsored it. Four of the presacral neurectomies were carried out by Prof. Telford or his assistant, Mr. H. T. Simmons; the other seven, and all the alcohol injections, were done personally.

REFERENCES

Balme, H. (1936) The Relief of Pain, London.
Behney, C. A. (1935) *Ann. Surg.* **101**, 411.
Bernard, R., and Theodorescu, D. (1928) *J. Chir.* **31**, 340.
Cotte, G. (1932) La Chirurgie du Sympathique Pelvien en Gynecologie, Paris.
Davis, A. A. (1933) *Trans. N. Eng. obstet. gynæc. Soc.* p. 38.
Depuy, C. A. (1935) *West. J. Surg.* **43**, 105.
Dogliotti, A. M. (1931) *Rev. neurol.* **38**, 485.
Ewer, E. N. (1935) *West. J. Surg.* **43**, 111.

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TECHNIQUE OF SOMNIFAINE NARCOSIS

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THE treatment of mental disorder by the continuous administration of narcotics over a period of one to three weeks has been in vogue on the Continent for many years and the most commonly used drug for this purpose is Somnifaine, which may be described as a mixture of barbitals (or barbituric acid derivatives), in a glycerin-alcohol-water solution designed for administration by the oral, intravenous, or intramuscular routes.

No clinician who has given prolonged narcosis a fair trial doubts that the treatment is beneficial. Where opinions differ widely is on the question whether the therapeutic advantage is worth the risk. If only a safe technique could be evolved continued narcosis would be more widely adopted. The present paper is an attempt to describe such a safe, simple method which can be used by anyone with ordinary care and attention to detail.

CHOICE OF TECHNIQUE

Broadly speaking there are three common methods of inducing and maintaining narcosis.

Klasi's original technique (1921) was unfavourably reported upon by Dawson and Barkas in 1925. The narcosis was initiated by a preliminary injection of morphia and scopolamine, followed by two ampoules (4 c.cm.) of somnifaine given intramuscularly. Further injections of somnifaine were given at irregular intervals when the patient showed signs of awakening. The idea was to maintain unbroken sleep for 8–10 days. Such a deep narcosis, however, inevitably led to a high fatality-rate, especially when conducted by those inexperienced in the use of narcotics, and so the method had fallen into disuse.

The second technique is described by Meerloo (1933) who gives an excellent account of the continental practice. He disregards sleep altogether, and concentrates his attention upon gradually producing a barbituric acid intoxication, working upon the theory that sudden disintoxication when the drug is withdrawn is the most important therapeutic factor. Avoidance of dangerous secondary complications by beginning with small doses of the drug, and slowly working up to the maximum, is the essence of this method. More or less continuous sleep may be achieved, but no attempt is made to hurry the patient into a profound narcosis. The injections are given at irregular intervals, and the diet is mainly liquid.

The third method introduced into this country by Ström-Olsen (1933) differs from the others in that he claims to have eliminated all toxic complications by giving injections of insulin in conjunction with somnifaine. His theory is that a disturbance of the carbohydrate metabolism of vital organs occurs during prolonged

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Greenhill, J. P., and Schmitz, H. E. (1935) *J. Amer. med. Ass.* **105**, 407.
De Grisogono, A. (1929) *Ann. Obstet. Ginec.* **51**, 567.
Harris, W. (1934) *Practitioner*, **133**, 225.
Head, H. (1893) *Brain*, **16**, 1.
Hilton, J. (1877) Lectures on Rest and Pain, 2ED., London.
Hurdon, E. (1937) Personal communication.
Jung, A., and Lucinescu, E. (1934) *Gaz. Hôp., Paris*, **101**, 1809.
Lavedan, J. (1935) *Paris méd.* **11**, 225.
Learmonth, J. (1935) *Brit. med. J.* **1**, 47.
Morley, J. (1931) Abdominal Pain, Edinburgh.
Paolucci, R. (1928) *Rinasc. med.* **5**, 97.
Russell, W. R. (1936) *Lancet*, **1**, 595.
— (1937) *Edinb. med. J.* **44**, 5, 78.
Ryle, J. A. (1936) The Natural History of Disease, Oxford.
Saltzstein, H. C. (1934) *J. Amer. med. Ass.* **103**, 4, 242.
Stern, E. L. (1934) *Amer. J. Surg.* **25**, 217.
Trotter, W. (1921) *Med. Sci.* **4**, 43.

narcosis with somnifaine. Following the usual practice he gives the injections at irregular times as the patient awakes and strictly adheres to a liquid diet.

Interest was aroused by Ström-Olsen's work, and many physicians attempted prolonged narcosis with the additional safeguard of insulin. But in 1935 Parfitt (1936) using the insulin-somnifaine technique had 2 deaths in 45 treatments. In spite of this he expresses the opinion that the use of insulin is an advance in treatment.

In the spring of 1935 six cases were given somnifaine and insulin in Plymouth Mental Hospital and the results were so alarming that the treatment was quickly abandoned. Pyrexia, tachycardia, dangerous coma, and threatened collapse followed so rapidly one upon the other that great dissatisfaction was experienced with the treatment. Possibly the technique was faulty from lack of experience, but the impression was gained that insulin increased the patient's excitement and feelings of apprehension. A year later in 1936 prolonged narcosis was again started following Meerloo's method with important modifications. In that year 100 cases were carried to a successful termination without a fatal result, and very few alarming complications.

Most writers are impressed with the danger first, of giving somnifaine at regular intervals during the day, and secondly, of feeding the patient on solid or semi-solid diet. The risk involved in the first instance is presumably overdosage of the drug leading to coma, and in the second aspiration pneumonia resulting from bulbar paralysis, which is one of the effects of the drug.

The method we have evolved in Plymouth differs from that usually advocated in that these dangers are regarded as illusory. The advantages of giving injections at stated times and of feeding the patient on the usual hospital diet are clear. There is no disturbance of ward routine, the medical officer can easily inspect each patient before ordering a further injection, and the patient is in no danger of starvation. The secret of success is to regulate the dose by clinical observation of the patient's condition, and to insist upon the patient being aroused at the regular hospital meal times. The patient must be made to sit upright in bed when feeding (or being fed by the nurse), and must be supported upon a commode when attending to the personal needs. By this means the chances of aspirating food are almost negligible, and the danger of pulmonary congestion from prolonged recumbency is obviated. These points will be referred to again in the detailed description of the method.

THE METHOD DESCRIBED

The patient can be nursed in an open ward with other patients of a quiet type. Isolation in a special ward with darkened windows is not essential, and sufficient privacy can be secured by screening off the beds of the patients undergoing treatment. Noisy and excited patients may require a single room for the first week until they are fully under the narcotic. Afterwards they should be transferred back to the open ward. A nurse should always be present, and on no account must the patient be left unobserved. After the first few cases the nursing staff quickly gain confidence and are able to detect at once the signs of overdosage. Before each injection the patient should be examined by the physician who decides whether to order or to withold the fresh dose. Regulation of the dosage according to the patient's condition is the essence of the method. Working upon the assumption that the action of barbital is mainly upon the nervous system, and knowing from clinical experience of veronal that the drug is cumulative, careful watch must be kept upon the rate of administration. Sufficient time must be given for the patient's excretory mechanism to adjust itself to the extra load. Always bear in mind that the minimum lethal dose of the drug is very near to the optimum therapeutic dose in prolonged narcosis. The details of the method are as follows:

On the first, second, and third days of treatment 2 c.cm. only of somnifaine are given each day by intramuscular injection at 2 P.M. after the patient's dinner. This small dose should produce 3–4 hours' sleep or less, and in some cases the patient is made more excited. Restlessness may be controlled by paraldehyde by mouth or by rectum. On the fourth day 2 c.cm. of somnifaine are again injected at 2 P.M. after he has had a full dinner and has passed urine. The same evening, after he has had the usual tea-time meal and again passed urine, a further 2 c.cm. of somnifaine are given at 7 o'clock, making a total of 4 c.cm. in 24 hours. Provided that everything is going well—the temperature, pulse, and respirations are normal, the patient is not too drowsy, is able to swallow without difficulty, and is not retaining urine—the dosage of 4 c.cm. is repeated on the fifth, sixth, and seventh days in divided doses of 2 c.cm. given at 2 P.M. and 7 P.M. each day. It will be observed that the drug is given at regular intervals and that no somnifaine is administered during the night, so that the patient has a clear space of 19 hours in which to excrete the doses already given. Should the patient awake or be restless during the night the nurse has instructions to give paraldehyde in doses of 2 drachms.

The eighth day is the most critical time and the physician must decide whether the patient can tolerate more than 4 c.cm. in 24 hours. In practice it will be found that patients can be divided into three classes: (1) a small weakly group who are rendered drowsy, limp, and ataxic by 4 c.cm. of somnifaine in 24 hours; (2) a larger group, including most individuals in robust health, who can easily tolerate 6 c.cm. in 24 hours; and (3) another small group of exceptionally resistant patients who can deal with 8 c.cm. in 24 hours without becoming profoundly intoxicated. If group 2 or 3 is indicated a third 2 c.cm. of somnifaine may be given with safety at 10 A.M. after breakfast on the eighth day, making a total of 6 c.cm. in 24 hours, given in divided doses of 2 c.cm. at 10 A.M., 2 P.M., and 7 P.M. Should there by any doubt it is wise to carry on with 4 c.cm. for a few days longer. If the patient falls into group 1, easily recognised by their extreme drowsiness and ataxia, then the narcosis is continued with a maximum of 4 c.cm. in 24 hours.

TABLE I—*Complications*

—	Men.	Women.	Total.
Total cases	47	53	100
Complications—			
Slight vomiting	8	11	19
Retention of urine .. .. (No. catheterised in parentheses)	1 (0)	5 (3)	6 (3)
Pyrexia (99°–100° F.) ..	13	15	28

MINOR COMPLICATIONS

Just about this time—i.e., the seventh day—when the question of maximum dosage arises symptoms of mild intoxication may appear. The most important are (1) a tendency towards nausea and vomiting, (2) retention of urine, (3) slight pyrexia up to 100° F. Since we are dealing with a narcotic drug the only safe procedure is to reduce the dose until the danger is past. No theoretical considerations of the therapeutic advantages of continued sleep should allow us to risk continuing the injections. Although the patient may appear to waken up when the dose is temporarily reduced he does not remember this

afterwards when the narcosis is ended. The incidence of these complications in the present series are shown in Table I.

Vomiting can easily be controlled by the subcutaneous injection of atropine sulphate gr. 1/100, as advised by Meerloo, in addition to omitting one or two doses. Since adopting the above simple procedure narcosis has never had to be terminated because of persistent vomiting.

Retention of urine is never serious if the patient is given ample fluids to promote diuresis and the nurse is instructed to raise the patient to an upright or sitting position during micturition. The catheter should never be used, and, if only a little more patience had been exercised, need not have been passed in the three cases mentioned. The golden rule is to suspend the drug and wait 24 or 36 hours until the bladder empties. Anuria or oliguria is never found where the dosage of somnifaine is properly regulated. About the seventh or eighth day the daily excretion may be reduced, but afterwards diuresis sets in and large amounts exceeding 100 or 150 fluid oz. may be passed. A 24-hour specimen should always be collected. The usual experience is that if the patient is excreting ample quantities of urine the narcosis may be continued without fear of unpleasant incidents.

Pyrexia up to 100° F. is not regarded as a serious complication and needs no treatment beyond suspension of the drug for a few doses. The pulse-rate usually increases to 90 or 100 before the temperature rises and is a useful check upon the patient's condition. As will be seen later, higher temperatures up to 102°–103° F. are an indication for stopping the treatment altogether.

DURATION OF TREATMENT

Having gradually worked up to the maximum daily dose this should be continued for about 14 days if the patient will tolerate this amount of the hypnotic. On the 21st day the dose is gradually reduced until by the 23rd day the course of injections is completed. In most cases the patient is out of bed in a week. Thus the treatment requires about a month in bed.

If these figures are further examined it will be seen that the patient receives injections of somnifaine for approximately three weeks; the first week is to be regarded as the period of induction of narcosis, the second two weeks are the period of full intoxication; the last three days are the period of withdrawal of the narcotic. In practice we have found that the patient has almost complete amnesia for the period of induction, so that the duration of the prolonged narcosis is approximately three weeks. This result compares favourably with the 10–14 days' narcosis attained by most workers in this country and abroad.

MAXIMUM DOSAGE

Recent communications from the insulin-somnifaine clinic at Cardiff (Hennelly 1936, McCowan 1936) show that now they rarely give more than 4 c.cm. daily. This contrasts with the statement of Ström-Olsen that the average effective dose is 5–6 c.cm. per diem. Meerloo remarks that the original dosage of 8–12 c.cm. a day has been reduced in time to an average of 2–4 c.cm. somnifaine a day with corresponding diminution in the number of successful treatments. It is evident that the addition of insulin has not arrested the downward trend. Careful analysis of the case-sheets of the 100 cases treated in Plymouth shows that 22 patients received 4 c.cm. daily; 72 had 6 c.cm. daily; and 6 patients only had 8 c.cm. daily.

If we add the 7 days' induction period to the figures for maximum dosage, the actual duration of narcosis in 100 cases was 14–17 days in 28 cases, and 21 days in 72 cases. Table II shows the number of patients with the approximate periods of maximum dosage.

TABLE II—*Maximum Dosage of Somnifaine*

Maximum daily dose (c.cm.)	No. patients with maximum dose for—		Total.
	7–10 days.	14 days.	
4	15	7	22
6	12	60	72
8	1	5	6

The statement made earlier in this paper that patients can be divided into three groups from the point of view of their tolerance for somnifaine is thus borne out by case analysis. The weakly asthenic type who can deal with at the most 4 c.cm. somnifaine daily are examples of idiosyncrasy to the drug, when given a large dose without preparation.

INDICATION FOR STOPPING TREATMENT

The only reason for abrupt termination of the narcosis in this series was pyrexia of 103° F. or over, with accompanying tachycardia. Four women had the treatment cut short for this reason on the 17th, 14th, 16th, and 19th days respectively. There is complete agreement amongst all workers upon the danger of continuing narcosis when the patient has a high temperature. Disturbance of the temperature-controlling centre in the hypothalamic region is usually regarded as the cause of the fever. An additional reason for ending the narcosis when the temperature rises is that there is always the fear that the patient may be developing a broncho-pneumonia, which is not easily recognised in its early stages. The only other indications for stopping the injections are extreme drowsiness with inability to swallow or increased restlessness and excitement. If the patient has had a fair period of narcosis of approximately 14–17 days, there is no object in pursuing the treatment and running the risk of coma and death from barbital poisoning.

Should these complications occur earlier in the narcosis the correct procedure is to suspend it temporarily. When the danger is past the drug may be resumed with doses of 2 c.cm. daily working up to the maximum as before. Some excited patients cannot be given prolonged narcosis with any degree of safety and in these cases the attempt should be abandoned. The dangers of trying to quieten continuously a restless and resistive patient by means of narcotics are too obvious to require further comment.

DEATHS

Meerloo quotes examples of fatal results from relatively small doses of somnifaine to show the danger of proceeding with the narcosis in patients who have an idiosyncrasy to the drug and are of an asthenic constitution. Much may be learnt also from analysis of the dosage given to fatal cases in this country (Parfitt 1936). One patient died after receiving 80 c.cm. of somnifaine in 11 days; another had 12 c.cm. in 3 days; a third 38 c.cm. in 6 days. Adopting the scale outlined previously and the method of gradual induction of narcosis, these patients would have received *at the most* 48 c.cm., 6 c.cm., and 18 c.cm. respectively. These quantities are the

maximum permitted, and as rigid adherence to any scale of dosage is not to be recommended, the actual amounts given might have been much smaller. The only safeguard of any value is close observation of the patient, with immediate cessation of treatment at the first sign of danger.

Cloudy swelling of the kidneys and liver which was found on post-mortem examination of these fatal cases is also found in persons who have died of typhoid fever, pneumonia, diphtheria, and many other acute infections or intoxications, and is not necessarily indicative of an irrevocable change in the cell, for after the acute infection is past the cells recover their normal appearance (MacCallum 1921). No one need be deterred from attempting somnifaine narcosis by fear of causing permanent damage to the liver and kidneys.

TREATMENT OF OVERDOSAGE

Many preparations have been recommended for the revival of patients with barbital poisoning including Coramine, strychnine, strophanthin, caffein-sodium-benzoate, adrenaline, and Icoral. To three cases who had been allowed to become comatose 5 c.cm. coramine was given by the intravenous route, followed by 1·7 c.cm. coramine with gr. 1/60 strychnine sulphate every hour until the patient revived. They all recovered and were out of danger in 4–6 hours. If the pulse-rate remained high the injections of coramine and strychnine were continued at two-hourly or four-hourly intervals. We have not required any of the other stimulants except strophanthin, which was given intravenously in a few cases where the heart's action seemed feeble. Lumbar puncture is essential in severe cases of poisoning, but was not found necessary in any of our cases.

CLINICAL PICTURE

This is subject to considerable variation according to the mental make-up of the patient: some patients smile foolishly at everything; others are in a maudlin, sentimental state; the majority show very little emotional disturbance. A few were in a delirious restless condition, and these required paraldehyde to control their excitement. Dysarthria, dysphagia, ataxia, diplopia, and nystagmus were present in varying degrees, and, in most patients who could tolerate 6 c.cm. somnifaine daily, gave no cause for anxiety. It is significant that the smaller group—i.e., patients who could deal with at most 4 c.cm. somnifaine daily—showed a greater incidence of these nervous disturbances.

The amount of sleep obtained also varied considerably according to the type of patient, and in the same patient at different stages of narcosis. The majority had an average 18 hours' sleep daily. It was found that the patients who had only a moderate amount of sleep benefited as much as those who slept almost continuously. The importance of sleep in treatment has been over-estimated. The great improvement seen in some cases appears to depend more upon the state of confusion and intoxication produced by the drug than the number of hours of restful sleep achieved. Under somnifaine the harmful train of thought is broken and the patient experiences a period of protective amnesia.

The nurse was instructed to rouse the patient for meals, attention to toilet, bowels, &c., as it was considered that adequate feeding and proper nursing attention were of more importance than continued sleep. By this means the danger of toxic complications was lessened. Interruption of the narcosis (in the true sense of the word—viz., barbital intoxication) was not caused by awakening the patient at regular intervals during the day. As a rule the patients dropped off to sleep immediately after a meal and the injection of somnifaine—if one should be ordered. Many patients would wake up in the mid-afternoon and shout loudly for dinner, having completely forgotten that they had eaten a full meal at the usual dinner hour. Loss of appreciation for time was a prominent feature of these cases and the more intelligent of the recovered patients described the treatment as a blank period in their lives. Another striking feature was that depressed patients remained dejected (in most cases) up to the end of the treatment and that the change of mood occurred suddenly on the third or fourth day after the narcosis. Similarly the excited patient continued talkative and restless at intervals throughout the course.

Before we had much experience of the treatment, and early in the series of cases, a few patients sustained minor injuries from rolling or throwing themselves out of bed. Disturbances of colour sense occurred in two women, the patients saying that everything looked blue or green. Three men had epileptiform attacks on the third or fourth day after the injections were stopped. Two of them on further inquiry were found to have had similar attacks several years before. One epileptic went through the course without a fit and has had none since, but he still retains the peculiar epileptic temperament. These epileptiform seizures after somnifaine did not have any injurious effect upon the patients and have not been repeated. Another patient, a case of dementia præcox, hiccupped constantly for two days but was relieved by hypodermic injections of atropine sulphate.

GENERAL HEALTH

In all cases the health remained good and in many it was improved by the treatment. Only 12 patients lost weight to the extent of 2–5 lb.; 10 maintained the same weight; and 78 increased in weight, some gaining a stone or over. This was only to be expected on the ample diet which included three pints of milk daily in addition to the usual hospital diet. The nursing staff were ordered to press large quantities of lemonade, barley water, &c., made with glucose, upon the patient. These results contrast with the loss of weight that is general where the patient is fed upon a meagre liquid diet given at irregular times.

No respiratory complications were encountered in the series and need not be feared in a properly conducted narcosis. All somnifaine narcosis was suspended when influenza was rife. This is one absolute contra-indication to prolonged narcosis. The deeply narcotised patient is a poor subject to withstand such a grave toxic infection.

THE URINE

Urinary analysis was carried out daily but did not help very much in the control of the narcosis. On no occasion did the urinary findings provide an indication for cutting short the treatment or even modifying the dosage.

Albuminuria.—In the present series, out of 47 men treated, 13 had a faint trace of albumin on three or four occasions, one only had a trace persisting for 18 days, and disappearing at the end of treatment. On the women's side out of 53 women treated, 35 had a faint trace of albumin on numerous occasions which did not persist. Catheter specimens were not collected, which explains the larger proportion of women with an occasional trace. One woman had a cloud of albumin on the 11th day, after retention and catheterisation. The albuminuria was

not persistent and did not interfere with the narcosis, which went on to the 17th day, when it was terminated because of drowsiness and difficulty in swallowing. Two patients (one man and one woman) contracted a *B. coli* pyelitis during narcosis. Neither had been catheterised. The condition cleared up after treatment and at no time was there any danger.

Glycosuria.—Fourteen men and five women had sugar in the urine at some time during the course. Blood examinations were undertaken on four men who had glycosuria on numerous occasions. The test was carried out in the morning without interrupting the narcosis, and in each case the fasting blood-sugar was normal and the sugar tolerance was within the limits of normality. The most probable explanation of the glycosuria is the excess of glucose in the diet. This view is supported by the higher incidence of glycosuria amongst the men patients, a fact which may be explained on the assumption that the male nurses were more assiduous in pressing glucose upon their patients. At the same time it was noticed that the men put on more weight than the women. Little mention is made of glycosuria in the literature.

Ketonuria.—Four women and one man had acetone in the urine on a few occasions only. In each case the ketosis was related to dysphagia, or to active refusal of food. The man had to be tube-fed three times because he resisted feeding. Two of the women also declined food for short periods. One woman had troublesome vomiting in the early stages of narcosis, which stopped after treatment. The last woman became comatose after morphia, and scopolamine had been injected in addition to somnifaine. In every case the ketosis disappeared when food was given.

Comments.—Most writers note the presence of occasional albuminuria, said to be a sign of toxic irritation of the kidneys. It is of no consequence and clears up completely at the end of narcosis.

The advocates of the insulin-somnifaine technique regard glycosuria as additional evidence of considerable derangement of carbohydrate metabolism (Ström-Olsen 1933). There is absolutely no evidence to support this contention.

No mention of ketosis as a complication of somnifaine narcosis is made by continental writers. This is surprising in view of the interest in toxic signs aroused by the high mortality in the early days of the treatment. It appears that this alleged ketosis (which Ström-Olsen states occurred in 70 per cent. of his narcosis cases before he gave insulin and glucose, which he regards as evidence of grave disturbance of carbohydrate metabolism by the narcotic leading to impaired nutrition of the heart muscle, and which he places first on his list of toxic symptoms) can be explained on much simpler grounds. To put the matter briefly, ketosis is the result of a faulty technique in which the patient is given an inadequate diet at irregular times and is permitted to sleep for long periods without food. The administration of insulin drew attention to the necessity of feeding the patient, because of the possibility of hypoglycæmia; glucose was given, and the ketosis disappeared. The same result has been attained in Plymouth by regularly feeding the patient. There is absolutely no indication for the use of insulin, which only adds an extra toxic factor to a treatment which is already sufficiently dangerous. In other words the action of insulin on the healthy subject is toxicological and not pharmacological.

While the laboratory experiments of Quastel and Wheatley (1932), on which Ström-Olsen partly founds his theory, are of general interest they do not prove the presence of a disturbance of carbohydrate metabolism in the living subject poisoned by barbiturates. The general opinion of pharmacologists is that the action of barbituric acid derivatives is entirely upon the central nervous system (Cushny 1928). The study of prolonged narcosis lends support to this view.

NURSING AND DIET

The care and the diet of the patient are of the greatest importance and I cannot do better than quote the written instructions handed to nurses on first taking over a case.

NURSING AND MANAGEMENT OF SOMNIFAINE NARCOSIS

The object is to produce prolonged drowsiness and sleep closely approximating to natural sleep. The patient is awakened at regular intervals for toilet, attention to personal needs, &c.; somnifaine is administered by intramuscular injection in doses of 2 c.cm., at times ordered by the physician. The patient must be under constant observation.

SYMPTOMS OF SOMNIFAINE INTOXICATION TO BE EXPECTED

The patient is limp, ataxic, unable to articulate properly, and has difficulty in swallowing. In the early stages vomiting, retention of urine, and oliguria are common. Once the narcosis is established diuresis is usual.

IMPORTANT POINTS IN NURSING

(1) Four-hourly charts must be kept of temperature, pulse, and respiration. A rise in temperature is the signal to suspend the treatment by omitting one or two doses of somnifaine. Increased pulse-rate should be reported at once.

(2) The 24-hours' urine must be measured and a specimen sent to the laboratory each morning.

(3) A record must be kept of the amount of liquid (milk, lemonade, &c.) consumed by the patient daily.

(4) The patient must be raised at regular intervals and should be assisted on to the commode. Bed-pans are not to be used.

(5) When taking food and liquids the patient must be supported in an upright position. Two nurses may be required if the patient is very limp. Care must be taken that the patient does not choke and as a rule spoon-feeding is required.

(6) Diet: as far as the patient can swallow solids, semi-solids, and liquids are given, ample nourishment is essential, and the patient ought to gain weight under the treatment. In addition to the ordinary diet three pints of milk with glucose, one tablespoonful to each glass of milk, must be given at intervals during the day and night. Lemonade with glucose added is also allowed. The nurse should endeavour to give the patient about 100 fluid ounces (5 pints) of liquid in the 24 hours.

(7) Bowels: simple enemata to be given on alternate days.

(8) Dosage of somnifaine is regulated by the condition of the patient. Paraldehyde two drachms may be given as ordered by the doctor, if the patient should be restless or have difficulty in dropping off to sleep.

(9) The narcosis lasts for 14–21 days, and the drug is to be withdrawn gradually.

(10) Improvement is only to be expected on the third or fourth day after the injections are stopped.

IMPORTANT POINTS TO WATCH

(*a*) That the patient does not roll or fall out of bed.

(*b*) That he or she is upright when feeding and is fed slowly to avoid aspiration of food particles.

(*c*) Temperature and pulse-rate.

(*d*) Keep a record of number of hours' sleep.

ILLUSTRATIVE CASES

CASE 1.—Man aged 27, single, bricklayer. Finger amputated five weeks before admission following an accident at work. Became depressed while under treatment for this. Admitted at mental hospital as voluntary patient, May 31st, 1935, in an acutely depressed state with feelings of guilt relating to the circumstances of the accident. Continued depressed with brief partial remissions up to Nov. 2nd, when he departed against medical

advice. Readmitted two days later profoundly depressed, sleepless, and unable to concentrate. He remained idle and dejected until January, 1936, when it was decided to try somnifaine. Physical condition: a robust healthy young man with no signs of organic disease. After trial doses of veronal to test for idiosyncrasy, somnifaine was given in 2 c.cm. doses by the method of gradual induction of narcosis, reaching the maximum of 6 c.cm. a day on the eighth day; on the next three days this was reduced to 4 c.cm. a day as he was extremely drowsy and had difficulty in swallowing. By the twelfth day the dysphagia had passed off and the dose was raised to 6 c.cm. per diem. On the eighteenth day temperature rose to 100·2° F.; pulse-rate, 104; respirations, 24; and 2 c.cm. only was injected. Next day temperature and pulse-rate were normal, and narcosis was continued with a dose of 6 c.cm. per day to the twenty-second day, when it was gradually reduced, and narcosis terminated on the twenty-fifth day.

He remained depressed throughout the treatment, and when awake reiterated his belief that his case was hopeless. Appetite was good. Dysphagia slight after the twelfth day. Ataxia, dysarthria, and nystagmus noted at intervals. Retention of urine absent. Urinary analysis: no albumin, sugar, or acetone at any time. Insulin was not given. Weight increased by 7 lb. On the fourth day after terminating the narcosis his mood suddenly changed to one of mild elation. He felt better than he had for months past, made plans for the future, and boasted of the number of bricks he could lay in a day. This feeling of well-being persisted up to the day of his discharge three weeks later. There has been no relapse, and he has remained at work for over a year.

This is an example of narcosis carried out without a hitch and shows clearly the safety of the method of slow induction combined with close clinical observation.

CASE 2.—Man aged 50 years, dockyard worker, admitted Feb. 1st, 1936, suffering from paraphrenia with delusions of persecution and auditory hallucinations. Physical condition: spare build and in good health. Always temperate in habits. Blood pressure 144/94 mm. Hg. On the first day given 2 c.cm. somnifaine which made him more excitable and argumentative. This dose (2 c.cm.) repeated on the second day when he was very restless and difficult to control. On the third day the dose was suddenly increased to 6 c.cm. in 24 hours. He slept most of the day. No vomiting, pyrexia, or other complications and full diet taken. On the fourth day 6 c.cm. somnifaine given in divided doses of 2 c.cm. He had some dysphagia in the evening, slept all night, and his pulse was good. Next morning he was unconscious, with shallow respirations, quick low tension pulse, and complete muscular relaxation. Coramine 5 c.cm. given intravenously followed by hypodermics of strychnine gr. 1/60 and coramine 1·7 c.cm. every hour. Glucose and saline given per rectum. He revived rapidly and three hours later could swallow easily and speak without much difficulty. Next day he was in his usual health. In view of the unfavourable prognosis of his mental illness somnifaine narcosis was not resumed and therefore this case is not included in the 100 successful treatments.

This case elucidates the dangers of hurried induction of narcosis. The error of technique consisted in suddenly increasing from 2 c.cm. to 6 c.cm. somnifaine on the third day when he ought to have had 2 c.cm. only, followed by (at the most) 4 c.cm. on the fourth day. It is incorrect to say that the patient's life was endangered by 16 c.cm. somnifaine. On the contrary, more than 100 c.cm. can be given with perfect safety provided that the dosage is cautiously increased in the first week.

SUMMARY OF RESULTS

The following is a brief statement of the results obtained from somnifaine narcosis:

Out of 100 cases treated 34 were discharged recovered; 16 remain in hospital improved; 50 were unchanged. No patient was made worse by the treatment. Of the recovered cases 5 relapsed within the year. The diagnosis was dementia præcox in 23 cases; melancholia in 37; mania in 19; paraphrenia in 15; and puerperal psychoses in 6. The most striking changes were obtained in melancholia. These figures compare very favourably with the results quoted elsewhere.

CONCLUSIONS

The object of this paper being to demonstrate a safe technique of somnifaine narcosis, based upon sound principles, no attempt will be made at present to give a detailed analysis of the results of treatment. Indeed, somnifaine therapy is peculiarly open to the objection that the patient would have recovered just as well with the month in bed without the treatment, and in early cases it is very difficult to say how far the narcosis was directly responsible for the improvement. The patients were selected mainly because their physical condition made them appear suitable subjects for prolonged narcosis, and 14 out of the 100 cases treated were chronic psychotics of over two years' duration.

There are no clear contra-indications to the treatment. Any patient not suffering from grave physical disease—including septic conditions—is a suitable subject. Exceptional care is necessary when dealing with debilitated individuals of asthenic build. Excited patients should preferably be treated by orthodox methods until their first excitement has subsided. There is an undoubted risk in attempting to force a resistive patient into continuous narcosis.

Continuous sleep is not essential or desirable. Some patients sleep most of the time and are no better at the end; others have only a moderate amount of sleep and make a good recovery. The mental confusion resulting from somnifaine intoxication seems to be the most important therapeutic factor.

Ketosis is not a complication of somnifaine narcosis, and only appears as a secondary effect when the diet is inadequate. There is no indication for insulin in addition to somnifaine, and its use only adds to the difficulties and anxieties of the narcosis.

My thanks are due to Dr. E. G. T. Poynder, medical superintendent of Plymouth Mental Hospital, for permission to report these cases.

REFERENCES

Cushny, A. R. (1928) Text Book of Pharmacology and Therapeutics, London, p. 251.
Dawson, W. S., and Barkas, M. (1926) *Lancet*, **2**, 1155.
Hennelly, T. J. (1936) *J. ment. Sci.* **82**, 608.
Klasi, J. (1921) Z. ges Neurol. u Psychiat. **74**, 557.
MacCallum, W. G. (1921) Text-book of Pathology, London, p. 92.
McCowan, P. K. (1936) *Lancet*, **1**, 508.
Meerloo, A. M. (1933) *J. ment. Sci.* **79**, 336.
Parfitt, D. N. (1936) *Lancet*, **1**, 424.
Quastel, J. H., Wheatley, A. H. M. (1932) *Proc. Roy. Soc.* B, **112**, 60.
Ström-Olsen, R. (1933) *J. ment. Sci.* **79**, 638.

DEMAND FOR MEDICAL MEN IN SOUTHERN IRELAND.—The National University Appointments Committee has just presented to the Senate of the University its first annual report. The observations of the committee on the "market" for graduates in the several faculties, our Dublin correspondent remarks, are instructive. Contrary to expectations the openings in all directions are so numerous that the committee has been unable to fill them all. The difficulties of finding employment for graduates apparently arise from the fact that many of them have taken degrees in faculties for which they are intellectually and temperamentally unsuited. There were more posts available for doctors than there were graduates to fill them. The committee had, indeed, to limit the demands reaching them by stopping all propaganda favouring the employment of medical graduates of the National University. In Southern Ireland at any rate the profession does not appear to be overstocked.

THE BACTERIOLOGICAL DIAGNOSIS OF WHOOPING-COUGH

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THE bacteriological diagnosis of whooping-cough became a practical measure when Chievitz and Meyer in 1916 introduced the cough-plate technique for isolating the Bordet-Gengou bacillus (*Hæmophilus pertussis*), and their method has been in use since at the Danish State Serum Institute (Madsen 1925, Kristensen 1933). The Bordet medium prepared on aluminium plates is dispatched to any practitioner requiring it, to be returned by post for incubation at the Institute. Despite a necessarily variable technique in taking the cough plates—for this may be done by doctor, nurse, or other attendant—the results have justified the organisation of this diagnostic service. In America the method is being adopted as a routine measure, but in this country little progress has been made despite successful results recorded by Sugare and McLeod in 1929 and by Gardner and Leslie in 1932.

Whooping-cough is deservedly attracting attention as an infectious disease of major importance, but as yet adequate measures for its control and prevention are not extensively employed. An important factor in control would be early diagnosis, since the initial stage of the disease is highly infectious. It is in this period that clinical diagnosis is difficult, if not impossible, and the blood picture is as yet equivocal, the characteristic lymphocytosis being not apparent until the second week (Sauer 1935). The isolation of the Bordet-Gengou bacillus as a diagnostic measure, however, has the particular advantage that it is most successful in the early catarrhal phase (Table I).

TABLE I

Isolation of H. pertussis *by the Cough-plate Method in Whooping-cough.* (*Various authors*)

Isolation of *H. pertussis* (%).				—
1st week (catarrhal).	2nd week.	3rd week.	4th week	
88·9	72·7	33·3	33·3	(Chievitz and Meyer 1916)
75	57	61	45	(Madsen 1935)
65·5	58·1	52·4	40	(Kristensen 1933)
75	67	75	25	(Gardner and Leslie 1932)
78	64	62	32	(Kendrick and Eldering 1935)
98	79	20	18	(Silverthorne and Fraser 1935)
98	65% (spasmodic)			(Sauer and Hambrecht 1930)

The present investigation was undertaken in an attempt to make the bacteriological method part of routine diagnosis in cases of whooping-cough admitted to the North Western Hospital, London. The laboratory work, including the preparation of the medium, was carried out at the London School of Hygiene.

At the outset, in November, 1934, the Danish modification of the Bordet-Gengou medium, as described by Gardner and Leslie (1931), was used, with 33 per cent. oxalated horse blood. Early in 1935 the blood was reduced to 25 per cent., and for a time the medium was poured on to plates in which a thin layer of 2 per cent. nutrient agar was already set. The number of positive cough plates obtained at this time was low, particularly during the period when the medium contained only 25 per cent. of blood and was poured on to the agar base. In all, 40 cases of whooping-cough in the first three weeks of the disease were examined and *H. pertussis* was recovered from 13 (32·5 per cent.). The percentage of blood should have been sufficient, for Kendrick and Eldering (1934) used less than 15 per cent. of sheep's blood and Sauer and Hambrecht (1930) used 17 per cent. of horse blood, although Sauer (1933) later increased the proportion to 25 per cent.

In May, 1935, Dr. Örskov kindly sent us details of the medium then being used at the State Serum Institute, Copenhagen, together with some actual plates. A trial of these suggested they were superior to ours and we decided to alter our formula for the medium by omitting the lactic acid, and increasing the proportion of blood to 50 per cent. We were fortunate at this period in having an opportunity of discussing points in technique with Dr. Gardner of Oxford, and Prof. Claus Jensen of Copenhagen. Thereafter the proportion of positive results increased. How much this was due to the altered formula for the medium or to a general improvement in technique it is difficult to say.

BORDET-GENGOU MEDIUM (DANISH MODIFICATION)

Our final method of making the medium is given below.

Clean and pare potatoes and cut into thin slices. Add 250 grammes of the slices to 500 c.cm. of tap water and 9 g. of NaCl. Boil till the potato slices fall to pieces, replace the water lost in boiling, and filter through linen. Adjust the reaction of the extract to *p*H 7·0. Add 500 c.cm. of the potato extract and 20 c.cm. of glycerin to 60 g. of agar (Bacto) dissolved in 1500 c.cm. of tap water. Distribute in flasks, autoclave, and store till required.

Cool the melted agar to about 48° C. and add an equal quantity of fresh defibrinated or oxalated horse blood warmed to about 40° C. Mix well and place in a water bath at 48° C. for 3–5 minutes. Pour into Petri dishes, avoiding bubbles in order to obtain a smooth surface. Incubate one plate to test for sterility; inoculate another with a stock strain of *H. pertussis* as a control of growth production.

It is essential to have the medium fresh and to keep it stored in a refrigerator or ice-chest. We did not use plates more than 10 days old. A useful guide is the colour of the medium; it should be a bright cherry red. A dark medium should be discarded.

COUGH-PLATE TECHNIQUE

The technique of exposing the cough plate is simple provided the patient is coughing. The natural spasm is essential; we found voluntary efforts ineffective. It is usually suggested that plates should be exposed for 10–15 seconds and held about six inches away so that no mucus reaches the plate. This procedure serves for the majority of cases, but occasionally in the older subject, especially if there is much catarrh, too heavy an inoculation is obtained and the medium may be swamped in 48 hours by secondary organisms; again in infants under six months old a plate taken in the same way may be sterile. We found it helpful to prescribe a number of actual coughs for the individual case—e.g., over five years, 6–8 coughs; three to five years, 8–12 coughs; one to three years, 12–16 coughs; under one year, 20–30 coughs. In infants the plate may be held as close as three inches from

the mouth. Plates taken from the beginning or the end of a spasm have an equal chance of giving positive results.

Difficulty arises, however, in the early stages when bouts of coughing are brief and infrequent. Various ways of eliciting a spasm have been suggested, such as a whiff of cigarette smoke after drinking cold water, touching the posterior pharyngeal wall or the larynx (Sauer and Hambrecht 1930), or pressure over the trachea (Silverthorne and Fraser 1935). In our final technique we made use of the cold drink and direct stimulation of the epiglottis in eliciting the natural spasm.

PHARYNGEAL SWABS

We found that in the early catarrhal phase, and especially with infants, satisfactory inoculation of the plate was often difficult to achieve, despite artificial methods of stimulating coughing. Perhaps only one plate could be obtained over 24 hours and with too light an inoculation. This meant delay in diagnosis at the most infectious period.

Alternative methods to the cough plate have been tried.

Sugare and McLeod (1929) were successful in using phlegm coughed up on to a sterile Petri dish. A loopful of this was spread by a bent glass rod on a plate of Bordet-Gengou medium and a second one similarly inoculated from a loopful of phlegm diluted in 2–3 c.cm. of saline. With this technique, 10 of 17 cases were positive, all but 2 in the first three weeks of illness.

Kristensen (1933) tried swabs from the posterior pharyngeal wall but without success. With laryngeal swabs, however, he was able to obtain positive results almost as often as from cough plates. His technique was to use a sterile probe bent at 130° and passed as far down the larynx as possible, taking care not to touch the mucous membrane of the mouth or fauces. The probe was inoculated on to two cough plates.

We have tried methods similar to Kristensen's. We first attempted to take swabs from the larynx by direct laryngoscopy using a Jackson laryngoscope, but this method was not suited to routine use. We then tried taking swabs from the pharynx. Using a straight spatula, the base of the tongue was depressed fully to bring the epiglottis into view. An ordinary throat swab was passed just over the tip of the epiglottis. Care was taken not to touch the posterior pharyngeal wall to avoid "gagging." Touching the epiglottis usually elicited coughing and presumably laryngeal and tracheal content impinged on the end of the swab.

The swab was withdrawn without touching the fauces or tongue, and replaced in the sterile test-tube in which it was supplied. For inoculation, 2 c.cm. of sterile saline was added to the test-tube and the swab stirred up in it. A loopful of this was placed on a plate and spread by a bent glass rod. The saline was then diluted with a further 5–6 c.cm. and well shaken up; a loopful of the diluted emulsion was inoculated on a second plate and similarly spread. In this way one plate usually showed a satisfactory discrete growth of organisms.

Although we describe the swab as "pharyngeal," the essence of the technique is to collect laryngeal content expelled by coughing.

In the final technique adopted a pharyngeal swab was taken just before food was due, so that as long an interval as possible had elapsed from the last meal; otherwise vomiting might occur if the patient should "gag" when the swab was being taken. A drink of water was given beforehand. The taking of the swab usually stimulated coughing which might last long enough to allow cough plates to be obtained as well. If not, plates were left for the nursing staff to expose, with instructions that the child should be given a drink of water after each meal. The nursing staff obtained satisfactory cough plates if one demonstrated a plate being taken and prescribed an optimum number of coughs for the individual patient.

IDENTIFICATION OF HÆMOPHILUS PERTUSSIS

Colony appearance.—Plates were incubated at 37° C. and examined from 48 hours onward, incubation being continued in negative plates as long as five days. The colonies of *H. pertussis* usually appear at 48–72 hours, but sometimes are delayed until the fourth or fifth day. The use of a hand lens or a colony microscope is essential in recognising and picking off the colonies. We found ordinary daylight the best illuminant.

On the primary plate *H. pertussis* produces a tiny, raised, hemispherical, glistening pearl-like colony. To the naked eye the colonies are highly refractile, but with the lens appear almost transparent when first visible. They may vary a little in size but are always uniform in shape. Using horse blood in 50 per cent. proportion, the zone of hæmolysis round the colony commonly described by American workers is not observed but may be apparent if a lower percentage of blood is used.

On Bordet medium, colonies of Pfeiffer's bacillus may be very similar, but there is greater variation in size and, more characteristic still, a variation in shape, the larger colonies found growing near other organisms being rather flat and often umbilicated. They are also more transparent. Diphtheroids may be confusing but their colonies are larger, greyer, and less glistening.

Morphology.—Stained by Gram's method *H. pertussis* appears as a small rather ovoid Gram-negative bacillus, tending to be arranged in clumps, giving the impression of a thumb-print. The ovoid shape and absence of pleomorphism differentiate it from Pfeiffer's bacillus. Little difficulty, however, was found in differentiation as Pfeiffer's bacillus usually did not grow in subculture on the Bordet-Gengou medium we were using, or at most was a thin translucent discrete growth compared with the definite grey "aluminium paint" streak of *H. pertussis*. Freshly isolated strains of *H. pertussis* fail to grow when subcultured on Fildes agar, in contrast to Pfeiffer's bacillus.

TABLE II

Isolation of H. pertussis *from 125 cases of Whooping-cough*

—	Positive.	Negative.	Total.
1st week ..	32 (86·5%)	5	37
2nd ,, ..	38 (84·4%)	7	45
3rd ,, ..	24 (70·6%)	10	34
4th ,, ..	4 (50%)	4	8
5th ,, ..	—	1	1
Total ..	98 (78·4%)	27	125

Agglutination.—Final identification was carried out using the agglutinating method recommended by Gardner and Leslie (1931). Slide agglutination proved useful for rapid diagnosis.

RESULTS

At the North Western Hospital from May, 1935, to August, 1936, 125 cases of whooping-cough were examined and *H. pertussis* was recovered from 98.

They were all children under seven years, the youngest being an infant of seven weeks. The results are recorded in Table II, according to the week of disease.

Routine examination in each case comprised two cough plates usually taken on the same day. If these were negative, further plates were usually taken so that the Table includes the results of more than one examination in certain cases—e.g., in 18 cases negative at the first examination, further sets of cough plates were taken and positive results obtained in 5. Also included in the Table is one case in which cough plates were negative but a pharyngeal swab was positive.

In the summer of 1935 we were asked by Dr. R. E. Smith to help him in the diagnosis of a small epidemic of whooping-cough in a public school, and he has kindly allowed us to quote his results. The 26 boys developing clinical pertussis were between the ages of fourteen and sixteen; and from 20 (76·9 per cent.) positive cough plates were obtained. Plates were dispatched by rail and returned to us after incubation overnight. Despite the interruption in incubation by the interval of transit, colonies were sometimes visible in 48 hours.

Pharyngeal swabs.—Pharyngeal swabs were taken in 47 cases coincidently with cough plates. The results are given in Table III. In 33 of these 47 the cough plates were positive, and in 21 of these 33 (65 per cent.) pharyngeal swabs were positive. On one occasion a pure culture was obtained. One case with negative cough plates was positive with the pharyngeal swab. These results show the pharyngeal swab to be less effective than the cough plate, but we feel that further practice with the technique might give results approaching Kristensen's. The method has the advantage of saving time, as the swab can be taken immediately, whereas one may have to wait some time pending satisfactory inoculation of a cough plate, particularly in the early stages.

TABLE III

Comparison of Pharyngeal Swab and Cough-plate Technique

Cough plate ..	+	+	−	−	Total
Pharyngeal swab ..	+	−	+	−	..
No. examined ..	21	12	1	13	47

SUMMARY

In our experience the bacteriological diagnosis of whooping-cough by the cough-plate method can be adopted for routine use. Of 125 cases of whooping-cough examined at the North Western Hospital in the catarrhal and early spasmodic stages, positive results were obtained in 98 (78·4 per cent.). Over 80 per cent. were positive in the first two weeks.

The basis of the method is a suitable medium, and a strict attention to detail is essential in its preparation. We finally used the Danish modification of the Bordet-Gengou formula with 50 per cent. fresh defibrinated or oxalated horse blood. Results were less successful with smaller proportions of blood, but others have found 20–35 per cent. satisfactory using either horse, sheep, rabbit, or human blood. Sauer has suggested placental blood.

As an alternative to cough plates, which may be difficult to obtain in the early stages, particularly in infants, pharyngeal swabs were tried, using a technique analogous to Kristensen's. They have the advantage that they can be taken without delay In a series of 47 cases the pharyngeal swab was positive in 22 (47 per cent.) compared with 33 (70 per cent.) positive with cough plates. The results justify more extensive trial of the method.

REFERENCES

Chievitz, L., and Meyer, A. H. (1916) *Ann. Inst. Pasteur*, **30**, 503.
Gardner, A. D., and Leslie, P. H. (1932) *Lancet*, **1**, 9.
Kendrick, P., and Eldering, G. (1934) *Amer. J. publ. Hlth*, **24**, 309.
—— —— (1935) *Ibid*, **25**, 147.
Kristensen, B. (1933) *J. Amer. med. Ass.* **101**, 204.
Leslie, P. H., and Gardner, A. D. (1931) *J. Hyg., Camb.* **31**, 423.
Madsen, T. (1925) *Boston med. surg. J.* **192**, 50.
Sauer, L. W. (1933) *J. Pediat.* **2**, 740.
— (1935) *Ibid*, **5**, 246.
— and Hambrecht, L. (1930) *J. Amer. med. Ass.* **95**, 263.
Silverthorne, N., and Fraser, D. T. (1935) *Canad. med. Ass. J.* **32**, 367.
Smith, R. E. (1936) *Quart. J. Med.* **29**, 307.
Sugare, H., and McLeod, J. W. (1929) *Lancet*, **2**, 165.

IMMUNISING FRACTIONS ISOLATED FROM *HÆMOPHILUS PERTUSSIS*

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A NUMBER of attempts have been made in recent years to isolate immunologically active fractions from bacteria by chemical means. The study of the chemical nature of such fractions is of great interest, and their use for prophylactic purposes in place of vaccines consisting of the whole organism may prove to be of value. *Hæmophilus pertussis* would appear to be a particularly promising organism from such a viewpoint because it is known to be antigenically homogeneous in the freshly isolated state so that one is not faced with the complexity which exists, for example, amongst the streptococci.

Although there have been certain attempts to break down the bacterial cell of this organism by various means, there are no records of any attempts to isolate or purify any particular antigenic component, and the crude products obtained do not seem to have been submitted to accurate comparative tests in regard to their immunising potency. Krueger, Nichols, and Frawley (1933) used a preparation ("undenatured bacterial antigen") which consists of the filtrate of thrice washed organisms ground in a special form of ball-mill. This was stated to be non-toxic to rabbits and to have immunised them against lethal doses of the living organism. Miller (1934) prepared extracts according to the methods of various previous authors and tested them for ability to stimulate complement-fixing antibodies in the rabbit. These "endotoxins," made by grinding dried organisms by extracting with hypertonic saline and by alternate freezing and thawing, showed varying degrees of toxicity and antigenicity, but their method of preparation as extracts of unknown concentration precluded any true comparison of their effectiveness, and some of them probably contained bacterial bodies. Filtration through an L_2 candle rendered one of the potent extracts inactive.

The work now described has consisted in the growth of *H. pertussis* in bulk, the fractionation by chemical methods of the dried bacteria, and the testing of the fractions thus obtained for their ability to induce active immunity in mice against a lethal dose of living organisms subsequently inoculated.

GROWTH OF THE ORGANISM IN BULK

The strains used were freshly isolated organisms in Phase I (Leslie and Gardner 1931), and were obtained from Bordet-Gengou cough plates from children with whooping-cough in the L.C.C. North-Western Infectious Diseases Hospital through the courtesy of Dr. James Westwater and Dr. R. Cruickshank, to whom our thanks are due. These strains, of typical cocco-bacillary morphology, were constantly tested throughout the work for full agglutinability by a Phase I antiserum and for virulence to mice by the method described below.

H. pertussis is a notably fastidious organism in its growth requirements, and the production in bulk of bacterial bodies presented not a few difficulties. The classical potato-extract glycerin blood agar of Bordet and Gengou was at first used, but owing to the large amount of blood contained it is expensive, and, further, the added carbohydrate is undesirable in view of the possible chemical analysis of fractions obtained. Many fluid and solid media were tried, including hormone broths with the addition of various substances such as lung extract, cystein, and the X and V factors necessary for the growth of *Hæmophilus influenzæ*, but growth was either poor or absent, or the organism tended rapidly to change its antigenic phase. The medium ultimately chosen was laked blood agar consisting of a base of heart agar prepared by the method of Wright (1934) with 1 per cent. proteose peptone to which after autoclaving were added 13 per cent. of horse-serum and 20 per cent. of a solution of horse blood laked by equal parts of sterile distilled water. These proportions were found after a series of tests to produce the best results, and glycerin, yeast, and cystein did not increase the growth. On this medium all strains grew well in 24–48 hours and have retained all Phase I characters for many months. It may be of interest to other workers in this field that organisms grown on laked blood agar prepared with a base of Hartley's tryptic digest of horse muscle instead of with heart agar prepared by Wright's method agglutinated poorly. All strains tested with a Phase I antiserum only agglutinated up to 1/200 dilution, whether whole or laked blood was used, the same strains agglutinating at 1/6400 dilution with the same serum when grown on the usual medium.

Roux bottles were conveniently spread with the 2-day growth of the organism from a small screw-capped bottle (McCartney 1933) and were incubated at 37° C. for 48 hours. It was thought preferable to scrape off the growth rather than to wash off with beads, since less material was thus obtained from the medium. The bacterial mass was thoroughly suspended in distilled water, then 50 per cent. acetone was added, and the suspension kept at 37° C. until sterile. The bacteria thus usually remained 3–4 days under acetone before the results of the sterility tests were known. They were then centrifuged down and dried completely in a high vacuum over phosphorus pentoxide. The dried acetone-extracted bodies were ground to a light brown sandy powder.

We are indebted to Dr. Catharine Begg, who has been responsible for the greater part of the production of the bacteria in bulk.

ANIMAL EXPERIMENTS

When the work was commenced there were few data regarding infection with *H. pertussis* in mice. Suspensions in Ringer were made of a number of freshly isolated strains. A 48-hour growth was standardised by opacity, and 1 c.cm. of varying dilutions of such suspensions was inoculated intraperitoneally into groups of, usually, 10 mice. Of 21 strains thus tested 17 had an average lethal dose of approximately 6–9000 million *H. pertussis*, the remainder failing to kill in that dose. The mice died usually in 2–3 days, rarely after the fifth day. Post mortem, a sticky mucoid exudate was found in the peritoneal cavity which was congested and showed often petechial hæmorrhages. In mice dying after 3 days it was common to find covering the intestine a thick yellow friable fibrinopurulent mat, microscopically seen to consist of masses of pus cells. The organism was easily recoverable from spleen and heart blood.

TABLE I

—	Doses.	Number of mice.	Survivors. Number and per cent.	Survivors. Standard error.
Controls	—	30	1 (3·33)	3·276
Immunised	6	30	13 (43·33)	9·047

TABLE II

Controls	—	20	1 (5·00)	4·873
Immunised	6	20	12 (60·00)	10·954

TABLE III

Controls	—	30	0 (0·00)	—
Immunised 1	3 of 0·2 mg.	30	16 (53·33)	9·108
Immunised 2	6 of 0·2 mg.	30	22 (73·33)	8·074

TABLE IV

Unimmunised controls	—	30	1 (3·33)	3·276
Immunised with—				
Acetone extracted bacteria	6 of 0·2 mg.	30	17 (56·67)	9·047
F68	6 of 0·2 mg.	30	17 (56·67)	9·047
Undigested residue	6 of 0·2 mg.	30	14 (46·67)	9·108
Mother liquor	6 of 0·2 mg.	30	1 (3·33)	3·276

TABLE V

Unimmunised controls	—	30	0 (0·00)	—
Immunised with—				
Acetone-extracted bacteria	6 of 0·3 mg.	30	29 (96·67)	3·276
F68	6 of 0·3 mg.	30	28 (93·33)	4·555
Residue	6 of 0·3 mg.	30	27 (90·00)	5·477

The lethal dose of similar suspensions killed by heating to 56° C. for half an hour was about 5–6 times that of the living organisms.

PRELIMINARY EXPERIMENTS IN IMMUNISATION

All our experiments were carried out on the same plan. Groups of mice were inoculated intraperitoneally with the antigen under test over a period of three weeks. At the end of that time 30 immunised mice along with 30 non-immunised controls were inoculated intraperitoneally with a dose of living

organisms, sufficient to kill all or nearly all the controls. The mice were observed for 4 weeks, although deaths hardly ever took place after the fourteenth day.

In the preliminary experiment a group of mice received on two successive days each week over a period of 3 weeks injections of a simple saline suspension of *H. pertussis* killed by heating to 56° C. for half an hour. Each dose contained 600 × 10^6 *H. pertussis*. The mice along with the controls, 30 in each group, were infected intraperitoneally 12 days later. The results are shown in Table I. A marked degree of protection was induced, evidenced by the higher survival-rate of the immunised mice.

It should follow from our knowledge of the serological identity of freshly isolated strains of *H. pertussis* that a vaccine prepared from any one strain should protect against any other. In order to test this, a group of 20 mice immunised with the same vaccine as the previous group was infected with a different strain. As shown in Table II, a degree of immunity of the same order as in the previous experiment was obtained.

The next step consisted in the selection of a suitable immunising dose of the acetone-extracted and dried bacteria, and the testing of the immunity conferred by them. Their toxicity was tested by injecting into groups of 10 mice doses graded from 1·0 to 10·0 mg. in suspension in Ringer. The average toxic dose for mice lay between 5 and 10 mg., probably nearer the larger figure. An immunising dose of 0·2 mg. was selected and this was injected into 2 groups of mice, (1) once weekly for 3 weeks, and (2) twice weekly for 3 weeks. The infecting dose was given one week later. The results are shown in Table III.

Both immunised groups showed a considerable degree of immunity and the benefit of an increased immunising dose was evident.

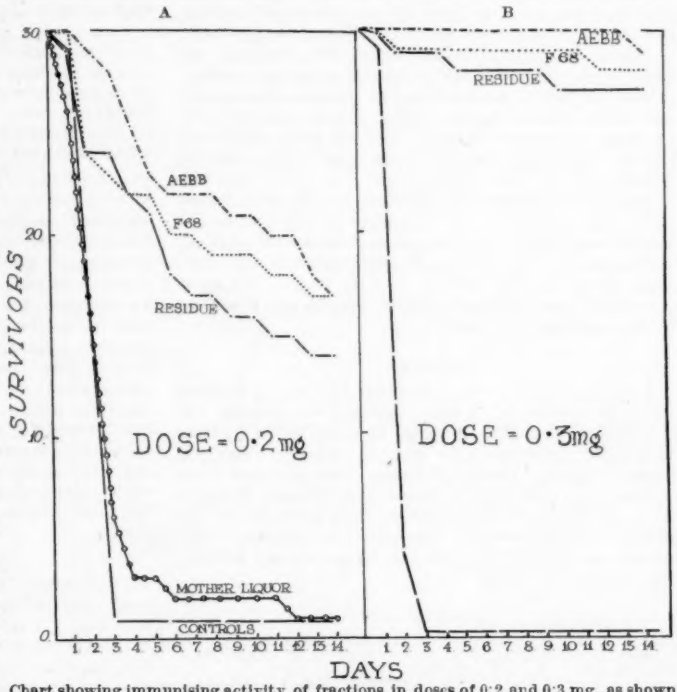

Chart showing immunising activity of fractions in doses of 0·2 and 0·3 mg., as shown also in Table IV and V respectively.
AEBB = acetone-extracted bacterial bodies.

PREPARATION OF FRACTIONS

The dried acetone-killed bacterial bodies were submitted to digestion by trypsin at 37° C. and *p*H 8·5 according to the method of Raistrick and Topley (1934).

Each batch was made up as follows:—

Dried bacterial bodies, 1·5 g.; water, 300 c.cm.; N/10 sodium hydroxide, 2·4 c.cm.; toluene, 15 c.cm.; trypsin (B.D.H.), 0·15 g.

Half of the trypsin was added at the beginning of digestion, the other half after 2½ days. Further small additions of N/10 sodium hydroxide were made, if necessary, to maintain the reaction of *p*H 8·5. After 5 days in all the greyish-brown very opalescent liquid was freed from toluene by evaporation in vacuo, and centrifuged at 4000–5000 r.p.m. until nearly free from opalescence. The insoluble residue was dried to a steel-grey powder ("undigested residue"). It constituted about 15 per cent. of the bacterial bodies.

The cleared tryptic digest was passed through a Chamberland L_2 candle and the filtrate concentrated in vacuo at 45° C. Alcohol was added to 68 per cent. concentration by weight and the precipitate formed was centrifuged down and dried. This fraction, 10–15 per cent. of the original weight of the bacteria, dries to a light cream-coloured powder and is known as F68. The alcoholic mother liquor fraction containing low molecular weight protein degradation products was also isolated.

TESTING OF FRACTIONS

The immunising activity of these fractions was tested in the usual manner. The vaccinated mice received in each case 0·2 mg. of the fractions twice weekly for 3 weeks, and were infected one week later. The results are shown in Table IV and Fig. A.

The immunity conferred by the F68 fraction is of the same order as that conferred by the acetone-extracted bacteria, and the undigested residue, as would be expected, is only slightly, if at all, less active. The mother liquor is devoid of immunising activity.

Another group of 30 mice which had received the same number of injections of acetone-extracted bacteria from a partially rough strain of *H. pertussis* gave 33·3 per cent. of survivors.

It was of interest to see whether the grade of immunity could be improved by increasing further the immunising dose and for this purpose mice were inoculated with 0·3 mg. twice weekly for 3 weeks. Table V and Fig. B show the surprisingly high degree of immunity to infection one week later, the acetone-extracted bacteria, the F68 fraction, and the undigested residue all protecting over 90 per cent. of mice.

The F68 fraction of *H. pertussis* dissolves readily in water to give a slightly opalescent solution. Its

chemical nature will be a matter of great interest, but it is proposed to purify it further before subjecting it to detailed study. The crude fraction has been shown, however, to be free from intact protein. A 0·4 per cent. aqueous solution gives no precipitate with either trichloracetic acid or sulphosalicylic acid. It gives positive Molisch, Millon, ninhydrin, and biuret reactions but a negative Adamkiewicz reaction.

Burnet and Timmins (1937) have recently shown that it is possible to infect mice by the intranasal instillation of a dose about a hundredth of that employed in the above experiments. Death with signs of pneumonia follows in 5–12 days. We have confirmed these findings and are testing our fractions by this technique of infection.

SUMMARY

An antigenically active fraction has been obtained from *H. pertussis*, which appears to possess an immunising potency, as tested in mice, equal to that of whole bacterial cells derived from a virulent Phase I strain. Bacterial bodies were digested with trypsin, the digest centrifuged and filtered through an L_2 candle, and the fraction (F68) precipitated by addition of 68 per cent. alcohol. This fraction contains no intact protein and can be stored in a readily soluble powder form.

REFERENCES

Burnet, F. M., and Timmins, C. (1937) *Brit. J. exp. Path.* **18**, 83.
Krueger, A. P., Nichols, V. C., and Frawley, J. M. (1933) *Proc. Soc. exp. Biol., N.Y.* **30**, 1097.
Leslie, P. H., and Gardner, A. D. (1931) *J. Hyg.* **31**, 423.
McCartney, J. E. (1933) *Lancet*, **2**, 433.
Miller, J. J. (1934) *J. Immunol.* **26**, 247.
Raistrick, H., and Topley, W. W. C. (1934) *Brit. J. exp. Path.* **15**, 113.
Wright, H. D. (1934) *J. Path. Bact.* **39**, 359.

A STABLE FERROUS SULPHATE MIXTURE FOR THE TREATMENT OF NUTRITIONAL ANÆMIA IN YOUNG CHILDREN

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Ferrous salts in the form of capsules and pills have to a great extent replaced ferric salts in the treatment of iron-deficiency anæmia in the adult. For babies and young children ferric salts are, we believe, still in general use owing to the instability of the ferrous salts in solution, although the greater efficacy of iron in the ferrous form is established. We hope, therefore, that the following account of a series of cases treated with a stable solution of ferrous sulphate may be of interest, giving, as it does, some indication of effective dosage and the time taken to bring about cure.

THE MIXTURE

The prescription used was:

Ferrous sulphate	gr. 1½
Dilute hypophosphorous acid ..	♏ ¼
Dextrose	gr. 15
Chloroform water to	ʒi

The method of preparation is as follows:—

Dissolve the dextrose in some of the chloroform water, add the dilute hypophosphorous acid. Dissolve the ferrous sulphate in some chloroform water and add to dextrose solution. Make up to volume with chloroform water.

This mixture will keep for over two months at room temperature without any precipitation.

We first used, five or six years ago, a solution of ferrous sulphate with dextrose only, having seen the excellent results obtained therewith by Prof. L. G. Parsons and his colleagues. For out-patient use something more stable was desirable as some deposit might appear in the bottles of medicine by the end of a week. Dilute hypophosphorous acid was therefore added in addition to dextrose to prevent oxidation. Before the publication of the British Pharmacopœia 1932 we added dilute hypophosphorous acid to our syrup of ferrous iodide at the Queen's Hospital for Children to retard oxidation, and hence the suggestion to add it to this mixture as an extra precaution. The official B.P. syr. ferr. iod. now contains hypophosphorous acid. After trials with varying quantities of the ingredients, we adopted the prescription given above and found it satisfactorily stable.

CLINICAL MATERIAL

The mixture was tried on babies and young children with nutritional anæmia attending the Queen's Hospital. Excluding children who had less than 3 weeks' treatment, and 2 cases known to have had very irregular treatment, our series consists of 26 consecutive cases given the mixture. We had hoped to have, or rather we had aimed at having, a considerably larger series, so that by graded doses we might establish the smallest amount which would usually cure at the maximum rate. However, iron treatment is now so widely used in the districts served by the Queen's Hospital that it is difficult to collect many untreated cases of anæmia of any severity. This must not be taken to imply that infantile anæmia is being banished. Prophylactic treatment of babies seldom seems to be carried out systematically, so that mild anæmia is unfortunately still common, and the treatment of more serious cases is often inadequate, but *any* previous treatment rendered the children unsuitable for our present purpose. Everyone who has worked with severely anæmic infants will realise that it is difficult, because of their very low resistance, to get a series uncomplicated by infection. On account of the increased risk of infection in hospital wards, most of our cases were treated as out-patients. In spite of this about half had already, or developed later, an intercurrent infection, ranging in severity from a cold in the head to pneumonia with otitis media. The infections diagnosed have been shown in the Tables, and their bearing on the interpretation of results will be considered later. Out-patient treatment introduces an element of uncertainty into the actual dosage received by the child, but as a check on this the mother was asked at each attendance whether or not the supply of iron given was completely finished; and we believe that in most cases the full amount, or almost the full amount, was given.

About half the children were 6–12 months old and the rest were between 1 and 3 years.

RESULTS

The iron mixture was given thrice daily in 1 drachm or 2 drachm doses. It was always begun gradually, the full dose being reached in 3–5 days. Given in this

way, it was always well tolerated, and there were no complaints of loose stools or colic.

The results of treatment are summarised in Tables I and II; the first gives the data for children ordered gr. 9 ferrous sulphate daily, the second for those ordered gr. 4½. The cases are arranged in the order of their initial hæmoglobin levels, because there is, we think, a tendency for the more severe anæmias to respond to treatment more rapidly than the less severe; and for the same reason those in Table II, with an initial hæmoglobin level of 60 per cent. or over, are shown separately, there being no corresponding cases in Table I to balance them. In comparing below the results with the two doses of iron, children with an initial hæmoglobin level of over 60 per cent. are, for the most part, excluded. In order to get as fair a comparison as possible we show the average weekly rise in hæmoglobin over the first 3–5 weeks of treatment: when estimations are available after exactly 4 weeks' treatment these are shown, otherwise the nearest to this period. As normal levels are approached the weekly rise is usually slower—a point which needs to be kept in mind.

Table I shows 7 children with an average initial hæmoglobin of approximately 46 per cent., who received gr. 9

TABLE I—EFFECT ON HÆMOGLOBIN OF GR. 9 FERROUS SULPHATE DAILY

Case.	Age (months).	In- or out-patient.	First 3–5 weeks of treatment.							Days taken to reach 80 % Hb.	Highest Hb. level.			Total duration of treatment (days).
			Initial Hb. %	Days of treatment.	Subsequent Hb. %	Rise in Hb. %	Weekly rise in Hb. %	Infections, &c.	Weekly change in wt. (oz).		Hb.	When attained (days).	Other infections.	
1	9	O.P.	38	28 N.f.	80	42	10·5	Cold in head.	+ 2·3	28 N.f.	85	77 irreg.	Otorrhœa.	99
2	10	„	38	35 irreg.	85	47	9·4	Loose stools, bronchitis.	+ 2·5	35 irreg.	85	35 irreg.	..	63
3	13	„	39	25	71	32	9·0	..	+14·0	46 N.f.	87	60 N.f.	..	78
4	6	„	45	28	78	33	8·2	..	+ 7·7	49	90	77	..	77
5	36	Both.	50	21	69	19	6·3	Pyrexia. ? cause.	?	91	83	91	Bronchitis, diarrhœa.	91
6	9	O.P.	55	28	75	20	5·0	Bronchitis.	+ 4·5	..	75	28	..	35
7	12	„	56	35	84	28	5·6	..	+ 4·0	49	87	49	..	63
Average..	13·6	..	45·9	28·6	77·4	31·6	7·7	..	+ 5·5	49·7	84·6	59·6	..	..

TABLE II——GR. 4½ FERROUS SULPHATE DAILY

UNDER 60 PER CENT. HB. AT THE OUTSET

8	18	I.P.	25	27	63	38	9·9	Pneumonia.	−0·5	42	81	42	..	49
9	21	„	41	28	57	16	4·0	Pneumonia, otitis media.	−1·6	81	80	81	..	81
10	16	O.P.	42	28	70	28	7·0	..	+1·2	42	83	70	..	70
11	19	I.P.	42	28	74	32	8·0	..	+4·6	49 irreg.	82	49 irreg.	Diarrhœa.	63
12	22	„	44	21	63	19	6·7	Bronchitis, 104° F.	−4·2	42	85	42	..	63
13	11	„	45	27	71	26	6·7	Whooping-cough.	+7·0	..	71	27	..	27
14	9	O.P.	46	32	69	23	5·0	..	+8·1	56	82	56	..	84
15	31	I.P.	48	37	74	26	4·9	Otitis media, loose stools.	+2·6	63	106	85	..	85
16	24	„	49	28	76	27	6·7	Rhinitis, sinusitis.	+1·1	42	85	70	..	77
17	13	O.P.	51	21	71	20	6·7	Stomatitis, adenitis.	+0·5	..	73	72 irreg.	..	96
18	8	„	52	21	69	17	5·7	..	+6·2	..	78	49 irreg.	..	65
19	13	I.P.	52	21	81	29	9·7	..	+4·2	21	93	105	..	178
20	10	O.P.	53	28	72	19	4·7	..	+3·7	70	89	125 N.f.	..	280
21	11	„	56	21	63	7	2·3	..	+8·2	42	93	109	Bronchitis.	109
22	8	„	57	28	70	13	3·2	..	+6·8	63	82	63	..	94
Average..	15·6	..	46·9	26·4	65·9	22·7	6·0	..	+3·2	51·1	84·2	69·7	..	..

OVER 60 PER CENT. HB. AT OUTSET

23	11	O.P.	60	35 irreg.	74	14	2·8	Diarrhœa.	+2·8	98 irreg.	80	98 irreg.	..	210
24	13	„	60	21	62	2	0·7	Adenitis, otitis.	+2·7	..	62	21	..	21
25	34	I.P.	65	21	82	17	5·7	..	+5·3	21	82	21	..	28
26	14	O.P.	66	28	91	25	6·2	Stomatitis.	+3·0	21	105	39	..	178

Hb. = hæmoglobin. N.f. indicates that mother states nearly full quantity of mixture was given, and irreg. that iron was omitted for one or more days. When not otherwise indicated, full dose is said to have been given daily.

ferrous sulphate daily. All but one were treated as out-patients. The weekly rise in hæmoglobin during an average period of approximately 29 days' treatment was 7·7 per cent. In different children the average weekly rise varied from 5 per cent. to 10·5 per cent. Four of the children had mild infections.

Table II shows 15 children with an average initial hæmoglobin of approximately 47 per cent., who received gr. 4½ ferrous sulphate daily; 8 were in-patients and 7 out-patients. The weekly rise in hæmoglobin during an average period of approximately 26 days was 6·0 per cent. In different children the average weekly rise varied from 2·3 per cent. to 9·9 per cent. In this group, 7 had infections during the first 3–5 weeks of treatment, including two attacks of pneumonia and two of otitis media.

The average number of days taken to reach a hæmoglobin level of 80 per cent. was almost the same in the two groups—namely, 50 and 51 respectively in round figures (if we omit 4 children who had less than 50 days' regular treatment and who did not attain this level). Out of 26 children 19 reached a higher level than 80 per cent. before discharge. The average of the highest hæmoglobin levels attained was about 84 per cent. in each of the two groups we have been considering. Children receiving gr. 9 of the iron salt took an average of 60 days to reach their maximum hæmoglobin level; those on gr. 4½ took an average of 67 days. A rise of 1 or 2 per cent. after several further weeks of treatment has been ignored, for it gives a wrong impression to say that 87 per cent. of hæmoglobin was reached after 125 days of treatment, if actually a level of 85 per cent. was reached after, say, 42 days.

DISCUSSION

The results obtained with both doses of ferrous sulphate were satisfactory. After about 4 weeks' treatment the weekly rise in hæmoglobin of the children receiving gr. 9 ferrous sulphate daily averaged slightly higher than that of those receiving gr. 4½, but our figures do not entitle us to say that gr. 9 was a more effective dose, especially as the average time taken to reach 80 per cent. was about the same in the two groups. The infections suffered by the group on gr. 4½ were more severe—and this is reflected in the lower average gain in weight—and in some cases this factor undoubtedly retarded the rise during the early weeks of treatment. However, of the 15 children in the first section of Table II, the 2 with smallest rises in hæmoglobin had no obvious infection and both put on weight well, so that it is possible that the smaller dosage of iron was a limiting factor, and that they would have done better on gr. 9 daily. Both were out-patients, and it is of course possible that they did not receive their treatment regularly, although the mothers stated that the full amount was administered.

It is worth noting that in each group in spite of good response to treatment—in round figures, a rise of about 1 per cent. daily in the early weeks—the average time taken to reach 80 per cent. hæmoglobin was about 50 days, and individual cases took much longer (4 cases which never reached this level are omitted). Moreover, maximum hæmoglobin levels (which averaged about 84 per cent.) were not reached until after an average of 60 and 67 days respectively (a few children would certainly have reached higher levels with longer treatment than they received). In some cases treatment, after the first month, was known to have been irregular—but the data nevertheless indicate the need for continuing steady treatment for an *average* period of about 2 months, and a good deal longer in some cases.

Another point of interest is that the time taken to reach 80 per cent. and over by the less anæmic children is often just as long as the time taken by the profoundly anæmic. Bearing in mind the large numbers of children who get inadequate treatment, it might be helpful to impress on the mother at the outset the need for 8 weeks and more of regular therapy. The presence of an intercurrent infection nearly always necessitates more prolonged treatment. In our present state of knowledge it seems impossible to foretell the influence individual infections will have on the hæmoglobin level, though one knows that any infection, and particularly a pyogenic one, materially affecting the general health of the child, frequently prevents, while it lasts, any rise in hæmoglobin level with iron treatment, in spite of the presence of iron-deficiency anæmia. Our results leave us with the impression that during an intercurrent illness there is considerably more likelihood of a rise in hæmoglobin level if a ferrous salt is administered rather than a ferric salt; and the response to iron treatment shown by several children in this series with severe infections was striking.

The amount of iron in gr. 4½ of ferrous sulphate is about 60 mg.—more exactly 58·32 mg. We do not know whether a smaller dose would be equally satisfactory. Stolleis (1937) and Glanzmann (1937) have used another stable ferrous salt solution in smaller doses. They claim excellent results in babies with a solution of ferrous chloride and ascorbic acid—a preparation made by the Fabrik Promonta under the name of Ferro 66—in a dosage of 10 drops daily (Stolleis), or 15 drops daily (Glanzmann). This provides 25 and 37·5 mg. of iron respectively. Larger doses were used for older children. Neither author gives figures which would enable the reader to judge the average rate of rise in hæmoglobin which they obtained, so that we are unable to judge how Ferro 66 compares in efficacy with ferrous sulphate solution in the dosage we have used.

Among the causes for the inadequate treatment of anæmia in infants with iron and ammonium citrate and other ferric salts are (1) the large doses desirable, and the fact that when these large doses are suddenly started (instead of gradually) gastro-intestinal upsets are not unusual, and (2) that long periods of treatment are often necessary. The general use of a ferrous salt solution, effective in smaller dosage, and in a shorter period, should do much to make for adequate and thorough treatment.

Though for *therapy* a ferrous salt has great advantages, for *prophylaxis* on a wide scale the cheap and stable iron and ammonium citrate is effective and well tolerated, and can easily be incorporated in dried milk or stored for long periods in solution—and this, in our present state of knowledge, is the drug we would advocate for routine use.

SUMMARY

Hypophosphorous acid increases the stability of a solution of ferrous salt. A solution of ferrous sulphate with dextrose and a very small quantity of hypophosphorous acid is stable at room temperature for over two months, and is a satisfactory mixture for the treatment of anæmia in babies.

Treatment of 26 babies with iron-deficiency anæmia with doses of gr. 9 or gr. 4½ ferrous sulphate daily produced an average daily rise in hæmoglobin level of almost 1 per cent. over the first 3–5 weeks of treatment. The average rate of response in the group getting gr. 4½ of the salt was slightly less than that of those getting gr. 9, but the difference is at least in part due to the presence of more infection in the group getting the smaller dosage. A dose of gr. 4½ daily containing about 60 mg. of iron is very probably as effective as double that quantity.

Our sincere thanks are due to Miss Lorel Goodfellow for her help, and also to Sister E. M. Westbrook and the ward sisters.

REFERENCES

Glanzmann, E. (1937) *Schweiz. med. Wschr.* **67**, 436.
Stolleis, D. (1937) *Dtsch. med. Wschr.* **63**, 819.

A NEW TYPE OF ELECTRODE FOR USE IN THE FOURTH ELECTROCARDIOGRAPHIC LEAD

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In disease of the coronary arteries, and particularly in coronary occlusion, much attention has lately been paid in America to electrocardiographic precordial leads, and their use is gradually coming into vogue in this country. It is now clear that in anterior myocardial infarction (the T_1 type coronary thrombosis) precordial leads can not only confirm but also supplement the three standard limb leads, but in posterior occlusions (the T_3 type) chest leads so far have added little or no information to that obtained from the standard curves. The multiple extra leads advocated by some writers yield little more than the single precordial leads referred to later, and the suggested use of œsophageal leads for investigating posterior infarctions is not likely to be adopted. For clinical use the safer, speedier, and simpler the examination the better, provided the result obtained is effective. The method described below meets these requirements.

THE APPARATUS

Since April 19th, 1937, I have been using for chest leads a new type of electrode supplied for trial by the Cambridge Instrument Company. This electrode, made of German silver, is circular, 2 cm. in diameter, and its chest contact is exactly the size of a sixpence. As will be seen from Fig. 1, the terminal was connected up centrally in the electrode under trial. It is proposed now to off-set the terminal from the centre as likely to make the electrode more convenient to fix to the chest and to lessen the tendency for it to be levered out of position.

In private practice between April 19th and June 30th this electrode has been used in 45 out of 132 patients electrocardiographed, all cases of cardiac pain during that period having been investigated by the chest lead. Experience of the electrode has been entirely satisfactory. With a little Cambridge electrode jelly rubbed into the skin over the apex-beat it has been uniformly easy to obtain deflections and, when pushed through a slit in a short strip of adhesive plaster which is then applied horizontally to the chest wall, there has been no difficulty about keeping the electrode in place whatever the position of the patient. Occasionally I have added in sitting patients a shorter strip of plaster applied perpendicularly. Employed usually with the patients reclining, the electrode has also worked perfectly both with patients who for reasons of convenience have been electrocardiographed in the sitting position, and in orthopnœic patients examined in bed by the portable electrocardiograph.

My Cambridge standard electrocardiograph having had fourteen years' service is fitted with a camera capable of taking plates 7½ in. by 5¾ in. By modifying the scale of this old type of camera it is possible to obtain four sections, each wide enough for a single lead of ordinary voltage. This is impossible with the more modern cameras since these are made capable of carrying plates only 6¾ in. by 3¼ in., which are not wide enough to permit their being divided into four sections. Also the type of shutter on the newer cameras is exactly similar to that on the portable electrocardiographs, and it is not possible for the width of the aperture to be varied. Fortunately with the sliding type of shutter which is fitted to the old standard electrocardiograph it is possible to make the width of the aperture to any given section what one wills, within the limit of the width of the plate. I am informed by the Cambridge Instrument Co. that, should the demand arise, they are prepared to make their new electrocardiographs, both portable and standard, suitable for a fourth lead connexion, so that in taking the record the operator will connect the four leads at once and then turn the selector switch for leads I, II, III, and IV as required.

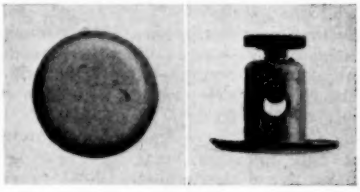

FIG. 1.—The electrode, full face and side view (natural size).

Meantime with the portable electrocardiograph two films have to be taken and my ordinary routine is to take one containing the three standard leads and the other recording leads I, III, and IV. In patients known to have anterior occlusion this second film can be varied to include lead II instead of lead III, or one section can be taken from an area of the precordium other than the apex. When a single film is being developed in a patient's house or in a nursing-home more comprehensive information is obtained from a record containing leads I, III, and IV than from a film containing the three standard leads. When it is desired to obtain electrocardiograms of chest leads from various areas this small electrode has obvious advantages over the rectangular plates measuring 2½ in. by 1½ in. that are employed at present.

ADVANTAGES OF ROTH'S LEAD IV

All my chest leads have been taken by Roth's method, the right-arm electrode being left in situ while the left-arm terminal was attached to the button electrode over the apex or, when the exact position of the apex could not be localised, over the left fourth intercostal space near the sternal border. It was found in cases where leads were taken from both these chest derivations that the curves were of similar type. Apart from modification of the axis of the R–S waves, which is of no practical importance, Roth's lead IV gives the same result as the antero-posterior lead IV in which the left-arm electrode is placed over the apex and the right-arm electrode fixed posteriorly between the left scapula and the spine. Over that lead, Roth's method has the advantage of the change-over to take lead IV being effected without any movement of the patient. The registration of lead IV is also made more quickly for it takes only a moment to loosen the left-arm terminal and screw it into the chest electrode.

Roth's method is clearly therefore the safer procedure to employ in patients who are gravely ill. Anyone who has read Roth's original paper (1935)

cannot but be struck by the great care with which he considered the results of other workers and his complete freedom from bias. The essential conclusion he comes to in his summary, which he modestly puts forward as a "suggestion," is that a chest lead for routine electrocardiography should embody the following features:—

"(*a*) That its tracing record maximal deflections and that it include well-defined auricular as well as ventricular complexes; (*b*) that its tracing be symmetrical with the standard leads; and (*c*) that the chest lead require but a single chest electrode. The right arm chest lead has been found to fulfil these requirements."

The lead IV of Wolferth and Wood (1932), where the right-arm electrode is placed over the apex and the left-arm electrode applied posteriorly between the scapula and the spine, contravenes both (*b*) and (*c*) and the picture given is an inverted image of what we have for so long known as the human electrocardiogram. The last objection also applies to the modification in which the right-arm electrode is kept over the apex but the left-arm electrode is moved to the left foot. That modification gives the same unfamiliar picture, but it does not necessitate any moving of the patient being as easy to employ as Roth's method. Although, as Freeman (1937) has lately stated, the inverted image has had a long start this clinical investigation is still in an early stage, and it appears to me against common sense to adopt this inverted lead IV in this country. Why must we look at a picture upside-down? That is the thesis of Willcox and Lovibond (1937), but since the lead IV which they advocate differs in no essential from that of Roth, which they used themselves in preference when patients were too ill to be moved in bed, surely the safer and quicker procedure should be chosen and, until a derivation is discovered which will give us information about posterior infarctions, Roth's method ought to be adopted as our standard lead IV.

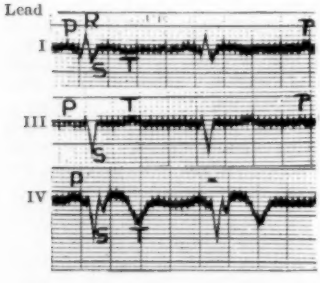

FIG. 2.—From a man aged 58. Taken in bed on May 14th in the recumbent position by the portable electrocardiograph, using the new electrode. Coronary occlusion on May 10th. In lead I RS–T elevation is slight and the inverted T is just coming into view. In lead IV the elevation is greater and already there is deep inversion of the T waves. Note also how the broadened and notched S_1 supplements the slighter aberration of the initial ventricular complexes in leads I and III.

RESULTS

During the period aforesaid I examined 17 cases of coronary thrombosis, 13 men and 4 women. The results were as expected.

In 10 out of 11 patients with occlusion of the T_1 type the findings were positive. Of these, 5 were seen in the initial stage and in 2 of these, who had low voltage curves in lead I and only slight R–T elevation, the distortion in lead IV was present in high degree (Fig. 2). One of these 5 patients made a rapid recovery and her standard three-lead electrocardiogram shows now no trace of her coronary thrombosis, but T in lead IV is still sharply inverted. The 6 remaining patients were seen at later stages. Of these I had examined 4 previously and taken a chest lead with the ordinary plate electrode in 3 of them. Of these, 3 still have the T wave inverted both in lead I and in lead IV, 1 has regained a positive T in lead I but T_4 is still negative (Fig. 3). One patient had a coronary thrombosis in May, 1934, with T inverted ten days later. My record three years later showed T_1 positive and T_4 iso-electric.

In only one case was a discordant curve obtained. He had been diagnosed as coronary thrombosis on April 1st. An electrocardiogram on April 5th was negative, but a second taken on April 11th showed inversion of T in leads I and II without any RS–T distortion. These records taken with a different type of electrocardiograph I saw. My electrocardiogram of June 19th showed general low voltage of the ventricular complexes, initial and final. T was just identifiable as a minute positive wave in leads I and II, in lead III T was flattened out, and in lead IV it was a positive wave of 2 mm. amplitude.

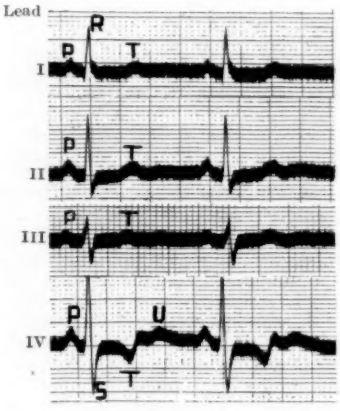

FIG. 3.—Woman aged 70. Taken on June 28th by the standard electrocardiograph in the sitting position, using the new electrode and a large plate. Coronary occlusion on Feb. 21st. The three standard leads now show no evidence of the thrombosis, but in lead IV T is still sharply inverted. Note also the U wave in lead IV.

In the 6 cases of coronary thrombosis of the T_2 type no additional information was obtained.

In the anginal group with T inversion the readings of lead I and lead IV were not uniform. Of 6 cases in which T_1 was inverted in only 3 did T_4 follow suit. The remainder of the series was purposely a miscellaneous collection and included bundle-branch block (both varieties), heart-block, auricular flutter, and auricular fibrillation. In all the complexes were adequately recorded. The W type of QRS, the "huge" T, and the prominent U were all met.

SUMMARY

(1) A description is given of a new type of electrode for chest leads, which is thought likely to meet with general acceptance.

(2) An account is given of its mode of application and of the results obtained in a series of 45 patients, 17 of whom were the subjects of coronary thrombosis.

(3) A plea is made for the adoption of Roth's method as the standard lead IV, because it is safer for those seriously ill, while it gives the familiar deviation similar to that in the three standard limb leads.

REFERENCES

Freeman, E. T. (1937) *Lancet*, **1**, 499.
Roth, I. R. (1935) *Amer. Heart J.* **10**, 798.
Willcox, A., and Lovibond, J. L. (1937) *Lancet*, **1**, 501.
Wolferth, C. C., and Wood, F. C. (1932) *Amer. J. med. Sci.* **183**, 30.

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION.—Courses suitable for M.R.C.P. candidates will be given in chest and heart diseases at the Royal Chest Hospital, on Mondays, Wednesdays, and Fridays, at 8 P.M., from Sept. 13th to Oct. 2nd, and in neurology at the West End Hospital for Nervous Diseases from Sept. 20th to Oct. 2nd. Detailed syllabuses of all courses, which are open only to members, can be had from the secretary of the fellowship, 1, Wimpole-street, W.1.

CLINICAL AND LABORATORY NOTES

A RAPID METHOD FOR THE DIRECT ESTIMATION OF UREA IN URINE

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(*From the Biochemical Institute, Cambridge*)

The general use of the blood urea-clearance test for renal efficiency has drawn attention to the desirability of an accurate method for the estimation of urinary urea which can be carried out with simple apparatus and which does not involve the simultaneous estimation of urinary ammonia. From experience gained by noting the work of some hundreds of my pupils during the past four years, I have modified the direct method I published in 1931.[1] It is now conducted much more rapidly and the technique is so simple that the results obtained are the most accurate of all the quantitative methods of analysis carried out in class work.

TECHNIQUE

Solutions.—1. N/6 HCl, prepared by diluting 100 ml. of N. HCl with 500 ml. of distilled water.

2. Acid potassium phosphate, KH_2PO_4, 3 per cent.

3. Brom-thymol-blue, 0·04 per cent.

4. "Mixed Indicator." Mix equal volumes of a 0·02 per cent. solution of methyl-red in 60 per cent. alcohol and of 0·04 per cent. aqueous solution of brom-cresol green. The indicators are conveniently stored in bottles carrying dropping pipettes. The "mixed indicator" should be freshly prepared about every two months, the methyl-red being somewhat unstable in the mixture.

5. Dilute caustic soda (about 0·1 N) in a bottle fitted with a dropping pipette.

6. Mercuric-ammonium chloride. Dissolve 0·5 g. of mercuric chloride in 250 ml. of distilled water. Add 250 ml. of a cold saturated solution of pure ammonium chloride. The solution should be stored in a bottle fitted with a cork carrying a 1 ml. pipette that has a safety bulb above the mark. It should be labelled *Poison*.

7. Urease. Transfer 5 g. of powdered jack bean meal to a 150 ml. flask, with a narrow neck that can be sealed with the thumb. To 10 ml. of the acid potassium phosphate add 90 ml. of distilled water. Pour this on to the meal. Seal with the thumb and shake vigorously for a minute. Filter through a pleated filter paper. The first 10 ml. generally come through cloudy and should be refiltered. The urease solution should be kept in a refrigerator when not in use. When thus stored it is sufficiently active after a month, but it is advisable to prepare fresh extracts every week.

Apparatus.—A 5 ml. micro-burette (A) and a 2 ml. micro-burette (B). These are filled to the mark with the N/6 HCl. The two burettes are conveniently clamped in a double Fisher burette-holder.

A 1 ml. pipette for the urine. It is advisable to use an Ostwald pipette, calibrated for delivery by blowing out after drainage.

A 5 ml. pipette for the urease.

A can of water at 40° to 45° C.

Boiling tubes, 6 by 1 inch.

Method.—Label two similar (in diameter) boiling tubes A and B. Into each measure 1 ml. of the urine, and to each add 3 drops of brom-thymol-blue.

To A add 5 ml. of the urease and warm gently in a flame. As soon as the fluid goes blue run in acid from the A burette to maintain a green tint (about *p*H 7, the optimum reaction for urease). Continue to add the acid as required, warming occasionally, but avoiding heating over 45° C. Generally in about 1 or 2 minutes the reaction appears to be completed. Place the tube in the water bath for another 5 minutes to ensure completion of the hydrolysis of urea to ammonium carbonate. Place the tube in a beaker of cold water whilst the control is being prepared.

To B add 1 ml. of the mercuric-ammonium chloride to inactivate the enzyme. Mix thoroughly and then add 5 ml. of the urease, being careful to prevent any transference of mercury to the bulk of the urease. Add 20 drops of the mixed indicator. Titrate, cautiously, from the B burette through green and a steel grey to the first definite mauve tint.

To A add 1 ml. of the mercuric-ammonium chloride and 20 drops of the mixed indicator. Continue the addition of acid to this from the A burette through grey to the first definite mauve tint. This colour fades at first, due to the slow conversion of H_2CO_3 to H_2O and CO_2. When the colour is permanent, add distilled water to B to make the volumes of the fluids the same in the two tubes. This may cause B to go grey. If so add a trace more of acid from the B burette to make the colours match. Should the titrations of either tube be overshot, add the dilute alkali, drop by drop, to the more acid tube until the colour is just mauve. Add exactly the same number of drops of alkali to the other tube. Titrate the tubes, from their appropriate burettes, until the colours match at a mauve tint.

Calculation.—The difference between the amounts of acid required for the two tubes is a measure of the urea decomposed to ammonium carbonate in A.

Since 60 g. of urea give 2 mols of $(NH_4)_2CO_3$ and this is neutralised to *p*H 5 by 2000 ml. of N. HCl,

Then 1 ml. of N/6 HCl = 5 mg. of urea.

So difference in ml. of acid required × 500
= mg. of urea in 100 ml. urine

and $\frac{\text{Difference in acid}}{2}$ = g. of urea in 100 ml. urine.

NOTES

1. The urease solution can be made by extracting 5 g. of the jack bean meal (about a teaspoonful) with 100 ml. of distilled water and filtering. The filtrate contains more protein than in the preparation described above. This protein is precipitated at the final end-point of the titration, and somewhat obscures the end-point. The cloud in the A tube is always somewhat greater than in the B tube, for some reason that I have been unable to determine. With the plain water extract there is always a marked increase in turbidity on allowing it to stand in the refrigerator. A good deal of this clears up on warming to room temperature.

2. The urease prepared by extracting with 0·3 per cent. KH_2PO_4 is rather acid, generally about *p*H 5·8. It is convenient, though not necessary, to treat the filtrate (generally about 80 ml.) with 5 ml. of a 4 per cent. solution of Na_2HPO_4. $2H_2O$ (Sörensen's salt). This gives a clear solution and the initial rate of action is much accelerated.

3. The optimum *p*H for urease is about 7, but it increases slightly as the concentration of urea becomes very low. If desired a fluid of *p*H 7 can be prepared by mixing 6 ml. of the 4 per cent. solution of Na_2HPO_4. $2H_2O$ with 4 ml. of the 3 per cent. solution of KH_2PO_4 and adding 20 ml. of distilled water. About 7 ml. of this can be placed in a boiling tube with 3 drops of brom-thymol-blue. The fluid in A should be kept at about the same tint as this, as near as possible. If the mixture is allowed to become a deep blue and is warmed to 45° C., there is a slight loss of volatile

[1] *Biol. J.* 1931, **22**, 422.

ammonia and the enzymatic reaction may not be completed. There is no loss of ammonia at *p*H 7 and with a normal jack bean meal the hydrolysis of the urea in 1 ml. of a urine that contains 2 g. per 100 ml. is complete in 3 minutes at 40° C.

The apparatus and materials required can be obtained from Messrs. Baird and Tatlock, 14, Cross-street, London, E.C.1.

ACUTE SUPPURATIVE ARTHRITIS AS A COMPLICATION OF VARICOSE ULCERATION

By J. B. Oldham, F.R.C.S. Eng.

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The modern treatment of varicose ulceration by adhesive elastic bandages has given such uniformly good results that we are inclined to forget even the possibility of complications and for that reason I am recording the following case.

The patient, a man aged 61 years, had suffered from varicose ulceration of his legs for over 20 years. When in the army in 1915 he underwent an operation for varicose veins in the left leg but the trouble soon returned and another operation was performed in 1923. In 1924 ulceration started in the right leg and since then he had been in hospital once or twice a year.

He was readmitted in September, 1936, when I saw him for the first time. Though he looked much older than his years his general condition was good. There was marked varicosity of the internal saphena vein on both right and left legs. The right leg showed the scars of healed ulcers. On the inner side of the left leg there was a deep ulcer about four inches long by three inches wide. I was informed that on previous occasions elastoplast bandages had not agreed with him, so after injecting the internal saphena vein on Sept. 23rd he was kept in bed. On Oct. 6th I decided to try the effect of an elastoplast bandage. When it was removed on Oct. 20th I found a slight dermatitis. After a few days in bed and the application of calamine lotion the dermatitis was relieved and another elastoplast bandage was applied.

On Nov. 2nd he complained of pain in his left elbow-joint. The joint was found to be swollen, hot, and tender, and any movement caused pain. The man was toxic-looking and his temperature 100° F.

When the elastoplast was taken off the leg was found to be acutely inflamed in the region of the ulcer. The lymphatic glands in the left groin were enlarged and acutely tender. Smears from the surface of the ulcer showed on culture a free growth of hæmolytic streptococci. The elbow-joint was aspirated and 2 c.cm. of pus removed; this pus also showed pure cultures of streptococci, identical with those from the ulcer.

Hot fomentations were applied to the leg and 5 c.cm. of Prontosil were injected daily for 5 days. The joint was aspirated on Nov. 3rd and 4th. Within three days the temperature began to fall and by Nov. 10th it was quite normal. The condition of the elbow improved rapidly and a week after the onset of the arthritis the joint was painless, though its movements were very limited.

A month later the movements of the elbow-joint were normal and the ulcer on the leg had practically healed.

The two interesting points in this case are (1) the occurrence of a suppurative arthritis as a complication of varicose ulceration; and (2) the quick and complete cure of the arthritis by repeated aspiration and injection of prontosil.

NEW INVENTIONS

A REBREATHING VALVE FOR USE WITH MAGILL'S GAS-OXYGEN-ETHER MACHINE

In course of a long series of general anæsthetics given in private practice with a modified Magill's apparatus to patients of a comparatively high average age—70 and over—I was impressed with the idea that some form of valve whereby rebreathing could be, if necessary, instantly stopped and completely controlled would be of considerable value. Although no exact records are available, my experience has been that with these old people, such as old men with prostates, the tendency is for cyanosis to develop rapidly, so that in many cases oxygen has to be supplied very freely to keep a good colour with adequate relaxation.

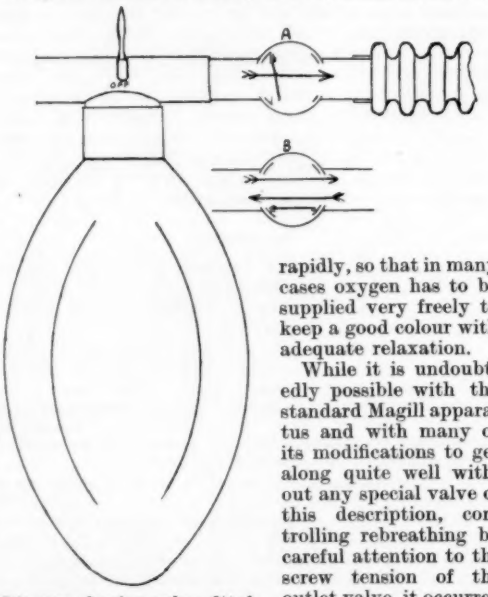

Diagram showing valve fitted between bag and wash. A, valve in action. B, valve out of action.

While it is undoubtedly possible with the standard Magill apparatus and with many of its modifications to get along quite well without any special valve of this description, controlling rebreathing by careful attention to the screw tension of the outlet valve, it occurred to me that a simple non-return valve, fitted at the bag outlet, might be of considerable value, and the one illustrated was made by Messrs. A. Chas. King Limited, London. It consists essentially of an internal barrel, capable of rotating through 90°, fitted with a single-sheet rubber non-return valve of the conventional butterfly pattern. It works very well indeed in practice in that it is helpful in controlling the depth of respiration, there being no rebreathing in the "on" position and as much as the operator may require in the "off." It controls the exact degree of inflation of the bag, without having to take the mask off the face or having to fiddle about with the gas-supply valves, thereby upsetting the composition of the mixture. It is also of value in the event of the sudden onset of cyanosis, as immediately the valve is kept full on in the circuit, carbon dioxide, apart from what little may remain in the bag, it is at once eliminated. Depth of respiration can be controlled with a nicety otherwise difficult to obtain, and by avoiding over-distension of the bag it is easier to economise in gases.

Thanks are due to Dr. I. Magill for permission to publish this note and to Dr. E. I. Davis, who has given valuable help with certain details in design.

O. P. Clark, L.R.C.S. Edin.
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BRITISH MEDICAL ASSOCIATION

SECTION OF MEDICINE

AT a meeting of this section, with Prof. W. W. D. THOMSON (Belfast), the president, in the chair, Prof. J. W. MCNEE (Glasgow) spoke on

Cholecystitis

He said it was one of the commonest diseases of the gastro-intestinal tract and might be found in men or women at almost any age. The increase in sedentary occupation leading to biliary stasis and possibly focal sepsis were essential facts in an ætiology otherwise indefinite. Treatment depended on whether infecting organisms were accessible to drugs in the bile or in the blood stream. It was catarrhal cholecystitis that he wished to discuss. Here the organisms were of low-grade virulence and the symptoms were mild. Continued flatulent dyspepsia was suggestive but diagnosis was often difficult. Pain and tenderness in the right upper quadrant of the abdomen were important signs and radiology was chiefly helpful if stones were present. In early cholecystitis duodenal intubation was the only completely reliable diagnostic method, and was not sufficiently used in England. Immediate examination of the centrifuged material for pus and organisms should be done, and he himself relied very little on results of culture. Differential diagnosis without the help of duodenal intubation was difficult, as diseases of the stomach, duodenum, and appendix, of the liver itself, or even of the heart might be imitated by catarrhal cholecystitis.

Prof. McNee believed that catarrhal cholecystitis could be cured by non-surgical means if treated early enough. His method was to drain the gall-bladder each morning with or without the use of the duodenal tube by a drachm of magnesium sulphate in an ounce of water before breakfast, and to give olive oil before each meal. This damped down acidity in the stomach and caused relaxation of the sphincter of Oddi. As to diet, he restricted only cooked fats and fried foods. In these cases the liver was always somewhat deranged and spa treatment might help greatly.

Sir ARTHUR HURST (London) found himself in almost complete agreement with Prof. McNee. Gall-bladder disease, he said, was very common; the most likely path of infection was from the duodenum following some transitory achlorhydric gastritis, such as gastric influenza or acute food poisoning when the duodenum might swarm with organisms. He did not think infection arose via the lymphatics or the blood stream. Catarrhal cholecystitis should always be borne in mind in cases of chronic dyspepsia; it might also be associated with other conditions. Pain was usually epigastric and repeated examination might reveal tenderness in the right hypochondrium. It should be remembered that a radiologist might report a "normal cholecystogram," but could not report a "normal gall-bladder." Examination of the contents of the gall-bladder was as essential as examination of the urine in diseases of the renal tract. If the bile was normal microscopically and on culture then the gall-bladder could be passed as normal. Abnormal findings were excess of mucus, definite groups of columnar cells, pus cells, pigment granules, and crystals; the last two provided conclusive evidence of gall-stones. Sir Arthur's practice was first to remove a specimen of duodenal contents, then to wash out the duodenum, and to give magnesium sulphate; he then compared the cultures from the duodenal specimen with those from the gall-bladder bile. If the gall-bladder bile grew the greater number of organisms definite infection was probable.

There was in his view a definite and close association between abnormalities of the gall-bladder and migraine. Like Prof. McNee he thought treatment should be by non-surgical drainage. In severe cases the duodenal tube should be used for a few days. He gave each morning just insufficient magnesium sulphate to cause diarrhœa, and half an ounce of olive oil a quarter of an hour before each meal. He believed in antiseptic treatment in biliary infections, and gave 100 grains of hexamine three times daily after the urine had been made alkaline (and was kept so). After a six weeks' course sterile bile might be obtained; if not the course could be repeated.

Sir DAVID WILKIE (Edinburgh) said that except in acute cases cultures made from bile and the walls of the gall-bladder following operation were mostly sterile, but by special methods a slow indolent blood-borne streptococcus had been found lodging in the submucosa in some cases. He thought that only a drug working through the blood stream could help to clear up infection and had great hope that Prontosil might be useful.

He believed surgery to be indicated when stones were associated with colic or digestive symptoms, because of the dangers of acute obstruction and the possible development of malignancy. In acute obstructive cholecystitis he recommended waiting 48 hours before undertaking operation. If symptoms were subsiding cholecystectomy could be done in 2–3 weeks, but if after 48 hours the temperature, pulse-rate, and leucocytosis were all increasing drainage was essential. It was also imperative to drain if the infecting organism was the *B. welchii*, in extreme old age, and with a stone in the common bile-duct giving rise to ascending cholangitis. Sir David spoke of the possibility that the gall-bladder might be a focus of infection, especially in rheumatism. The bacteriology of certain cases investigated showed a streptococcus to be a common infecting organism. In fat patients with breathlessness and symptoms of indigestion great improvement would ensue with loss of weight, and this was essential before operation was considered. In some cases also great improvement in symptoms of unquestionably cardiac origin had followed removal of an infected gall-bladder. He had seen three cases in which nephritis had apparently cleared up after the same operation. The prognosis in surgical cases was better after effective pre-operative treatment. In 956 cholecystectomies his mortality had been 1·8 per cent. In 190 cases of stone in the common bile-duct the mortality was 8·9 per cent., and all these cases had had jaundice.

Dr. T. GARRATT HARDMAN (Dublin) said the Graham-Cole test gave valuable information on the power of the gall-bladder to secrete and concentrate the dye, and on the condition of the mucous membrane. In most cases of dyspepsia complete examination of the gastro-intestinal tract was necessary. Stones containing more than 10 per cent. of calcium would show on an ordinary film. Papillomata might show as clear areas after the dye had been given, and occasionally carcinoma of the gall-bladder could be diagnosed. In 512 consecutive cases he had made a correct diagnosis in 88 per cent. of all cases, and in 91 per cent. of pathological cases. He always used the oral method. Radiological findings should not, of course, supplant ordinary clinical methods.

Dr. CHARLES MILLER (London) said that gall-bladder pain might imitate the pain of angina pectoris, or, again, the same patient might suffer from attacks

of pain from both gall-bladder and heart. He reported cases of undoubted attacks of angina with electrocardiograms showing an inverted T wave, whose attacks had cleared up, the electrocardiograms becoming normal, after removal of the gall-bladder and stones. There was ground for thinking that lesions of the heart and gall-bladder had some common symptoms as well as peculiar ones. In a comparison of the morbid anatomy of the cardiovascular systems of patients between 40 and 70 years affected with gall-bladder disease, and those whose gall-bladders were normal, arterial degeneration was found much more frequently in the former group.

Dr. G. BATTEN (Dulwich) asked what should be done for a patient, whose gall-bladder had been removed for stones, when symptoms recurred.

Dr. B. R. JOHNSTON (Westmorland) remarked on the frequent improvement in general health of the patient after cholecystectomy.

Dr. G. E. NESBITT (South Africa) asked Prof. McNee what kind of a tube he recommended for duodenal intubation and how the position of the tube could definitely be ascertained. He thought that where gall-bladder and cardiac conditions existed together there was probably a common cause for them.

Dr. H. COOKSON (Bournemouth) said that gall-stone colic was attended by less shock than was pain of cardiac origin, and disappeared more suddenly. He thought that biliary colic might produce reflex constriction of the coronary vessels. In 15 cases of chest pain associated with gall-stones he had found no change in the electrocardiogram.

Dr. L. E. ACOMB (Newport) said in his own case removal of teeth started a flare up in gall-bladder infection. Radiology was only of limited value.

Dr. N. E. WATERFIELD (Great Bookham) held that the pain in cholecystitis might be due partly to hepatic congestion. He asked whether preparations like Agocholine or Cholelith were of any use.

Dr. J. S. MCKELVEY (Saintfield) thought the terms dyspepsia and cholecystitis almost synonymous; his experience was that young people ate far too rapidly. He recommended magnesia and belladonna half an hour before each meal and magnesium sulphate each morning.

Dr. E. R. CULLINAN (London) regarded the gall-bladder as a tank at the end of the liver; and the functions of both organs were still rather mysterious. He emphasised the importance of the duodenal tube; intubation was not done often enough because of the supposed difficulty.

Sir DAVID WILKIE, in reply, said that prolonged drainage would help patients with recurrence of stone in the common bile-duct following operation. They should be drained for at least 14 days with a T tube into the duodenum. In his experience cardiac patients had not been operated on for pain but for cardiac disability. When a single stone was in the common bile-duct jaundice was more common than when multiple small stones were present, which might act as a filter.

Prof. MCNEE said that he used a tube made by Mayer and Phelps with the end of a pyramidal shape. Patients with gall-stones had really gone from the physicians hands by the time the stones had developed. Repeated attacks of catarrhal cholecystitis would cause stones. In cases of infection by the streptococcus he thought it impossible to reach the organism by disinfectants excreted in the bile; prontosil might be of use for this condition. In the present state of our knowledge magnesium sulphate and olive oil were the most helpful drugs.

SECTIONS OF PATHOLOGY AND RADIOLOGY

AT a meeting of these sections Dr. J. C. RANKIN presided at a discussion on

Bone Tumours

when Dr. R. E. ROBERTS (Liverpool) opened the subject from the radiological aspect. He described the changes produced by the growth of a bone tumour as being visible radiologically as changes either of *structure* or of *contour*; and he submitted a detailed scheme for the examination of radiograms of bone designed for the interpretation of changes of density, translucency, and contour in terms of pathology. He spoke also of the risks of attempting "spot diagnosis." A series of radiograms shown on the screen illustrated in detail the points to be observed in diagnosis. The two causes of increased density were actual bony thickening and a raised calcium content. While the former was attributable to a definite alteration in bone, such as the growth of an osteoma, the latter might be produced by pressure on the nutrient vessels, and the resulting ischæmia. Widespread interference with vascularity occurred in metastatic growth secondary to prostatic carcinoma, and was followed by sclerosing carcinoma of the pelvis. Increased translucency occurred when the bone was largely replaced by tumour tissue. A rapidly growing parosseous sarcoma with a rich blood-supply sometimes—though rarely—induced an intense hyperæmic decalcification in the neighbouring bone. The outline of any clear area was a most important consideration. If it was clearly defined it was unlikely to be due to a malignant tumour; in such a case Brodie's abscess, cyst, fibrosis, chondroma, and osteoclastoma were to be considered. Secondary deposits in the vertebræ were commonly shown by increased translucency associated with collapse of the vertebral bodies; but it was possible at an earlier stage to have the translucency without the collapse, the carcinomatous tissue acting as a support sufficient to preserve the contour. One type of sarcoma was easy to confuse in the radiogram with chronic osteomyelitis, syphilitic or pyogenic. If a surgeon operating on a supposed case of osteomyelitis found no pus the question of sarcoma should at once arise. A positive Wassermann reaction did not, of course, preclude all possibility of sarcoma. Treatment by deep X rays might produce endarteritis obliterans. Dr. Roberts showed the radiogram of a case in which under such treatment recalcification of the scapula occurred with reappearance of its bony outlines. While the diagnosis of peripheral or eccentric chondroma was usually made easy by the evidence of remains of cortical bone around the cartilaginous tumour, a central chondroma might be impossible to differentiate from a cyst, or from a giant-cell tumour. The latter tended to extend into processes of the bone, but not to break through the articular cartilage and it rarely perforated the cortex. These three conditions—chondroma, cyst, and giant-cell tumour—were often impossible to distinguish without biopsy. The importance of examining many bones in such conditions as fibrocystic disease and multiple myelomatosis was well recognised. The detection of the Bence-Jones proteoses in the urine in myelomatosis, or of a high calcium level in the blood in hyperparathyroidism, might settle a diagnosis otherwise doubtful. Metastatic deposits might also give multiple lesions, but mistakes in such cases only arose when the radiogram was interpreted by someone unfamiliar with the patient's previous history.

Dr. Roberts was doubtful about the identification of Ewing's sarcoma. In cases he had seen the dis-

tinction from osteomyelitis or from congenital syphilis had proved difficult. The typical appearance was of a "rubbing out" of part of the bony shadow as by india-rubber. The essential point in the diagnosis was that the tumour disappeared under a comparatively small dose of X rays. Metastases were also radiosensitive. In true sarcoma it was necessary to make an attempt to reach a diagnosis before the appearance of the sun-ray spicules typical of the X ray picture. He was convinced that by the time these spicules had appeared metastases had formed and it was too late to operate. Osteogenic sarcomata were usually single lesions, and did not cause expansion of the bone; the limits of the translucent area were irregular and ill-defined. They occurred typically at the lower end of the femur and at the upper ends of the humerus and tibia. The periosteal type of sarcoma caused changes in contour of the type which Dr. Roberts termed "subperiosteal bony proliferation." The same change was found also in simple periostitis, syphilitic periostitis, various types of osteomyelitis, and Ewing's tumour. Repeated radiography was useful in clinching the diagnosis, but it was unwise to delay operation. Expansion of bone suggested a simple tumour, but when the bony shell gave way the question of malignancy might be difficult to decide. Biopsy was a problem for the surgeon and pathologist. In simple tumours it carried no risk; in the diagnosis of sarcoma he felt himself that the help gained was not always as great as had been hoped. Biopsy was dangerous, but when all else failed the risk had to be taken.

Prof. J. S. YOUNG (Aberdeen) supported biopsy for its great value in early diagnosis of malignancy and for its safety as a surgical procedure. Clinical diagnosis alone was often inadequate to save lives that might be lost through delay. The surgeon had to depend on radiography and on biopsy. If the radiogram was convincing, treatment should not be further delayed. That five-year cures were possible was shown by the reports of the American Registry of Bone Sarcoma; but the proportion of such cures did not exceed one case in seven. Six cases out of seven were not treated till dissemination had started. Serial radiography he regarded as risky just because it involved delay in operating, while the use of the radiodiagnostic test (a test of the response to radiation) in any surgically accessible tumour always filled him with alarm. He instanced a case of Ewing's tumour which, while apparently disappearing in the X ray picture, was steadily advancing in the neighbouring bone. When secondary growths appeared at any stage in a patient who had at any time been subjected to biopsy, the biopsy was held responsible; secondary growths in a patient subjected to serial radiography or to the radiodiagnostic test were piously regarded as an act of God. Prof. Young advanced the hypothesis that the hydrostatic pressure within a bone tumour was the main factor in determining its metastatic spread. Anything which increased this pressure, such as the normally occurring hæmorrhages, increased the chance of metastasis. With the method of biopsy by puncture and suction of growth along the hollow wide-bore needle hæmorrhage in the substance of the tumour was bound to occur. It was asserted to be safe, but he regarded it as 100 per cent. dangerous. Incising the periosteum or the bone cortex freely and gently and excising a piece of the tumour, in fact the old-fashioned method which was regarded by some authorities with suspicion, was the method employed in the Royal Victoria Hospital, Belfast, and he regarded it as "safe." Animal experiments had shown that biopsy in the Flexner-Jobling rat carcinoma had not increased the incidence of metastasis. Seventy-four "five-year cures" were reported in osteogenic sarcoma by the American Registry of Bone Sarcoma. Twenty of these had had some form of biopsy or previous surgical interference. Here again the danger of biopsy was not apparent. His advice was that in every surgically accessible and radio-apparent bone lesion which might conceivably be a bone sarcoma decompression by open operation should be carried out as soon as possible; and during this open operation a piece of tissue large enough to be regarded as a fair sample of the lesion should be excised for the purpose of microscopical diagnosis. Open biopsy was not lethal and there was even a faint hope that decompression of the growth might minimise the risk of dissemination by lowering the hydrostatic pressure.

A contribution from Mr. HARRY PLATT (Manchester) was read by Mr. H. O. CLARKE. He said that diagnosis rested on a proper appreciation of the significance of the history of the case, the physical signs, X ray appearances, and the results of biopsy. The ultimate responsibility for the treatment adopted must rest on the clinician. He agreed with almost every word that Prof. Young had said, and he was delighted to hear such refreshing common sense talked on the subject of biopsy. He believed that the "dangers" of biopsy were an absolute myth. Exposure of the tumour allowed a naked-eye view of it as well as the opportunity to excise a piece for section. In Manchester they had found value from the Dudgeon smear and from rapid sections. Their practice had been to close the torn capsule, but, since Prof. Young's remarks, he wondered whether even that precaution was advisable. Surgical removal was the best method of treatment. In giant-cell tumours they curetted the tumour mass, or excised the affected bone. Amputation was reserved for very advanced cases.

Dr. J. F. BRAILSFORD (Birmingham) said that although in many cases the radiographic features of malignancy in a tumour might not be characteristic, in those very cases the clinical features also tended to be equivocal. He had found that the surgeon showed an anxiety to pass to the radiologist the responsibility for diagnosis and for the decision as to treatment. He believed in the value of the radiodiagnostic test: it indicated whether or not the tumour was radiosensitive. Biopsy was dangerous. Subjection of a growth to trauma, accidental or surgical, increased its rate of growth as did also incision of the bone. He thought that the proportion of survivals reported by the American Registry of Bone Sarcoma was well within the limits of accurate histological diagnosis. In the treatment of malignant bone tumours he regarded radiation as being only palliative.

Prof. J. MATTHEW STEWART (Leeds) expressed his entire agreement with Prof. Young's views in the matter of the open biopsy. He protested against the insistence of some surgeons on an immediate frozen section in bone cases. There was no comparison at all between the efficiency of the two methods—i.e., frozen sections and paraffin sections—in making a diagnosis in a difficult case; and the element of rush and hurry in attempting a diagnosis with the patient under an anæsthetic were unsatisfactory. His opinion on the subject of giant-cell tumours had changed. He no longer regarded the diagnosis of such a tumour as justifying a good prognosis in every case, since recurrence and even metastasis occurred in a small proportion of them. For a diagnosis of osteoclastoma

the giant cells must be more or less universally distributed throughout the growth and in addition the matrix must arouse no serious suspicion of malignancy. If this tissue was irregular or bizarre, with great cellular and nuclear heteromorphism or frequent mitoses, even if osteoclast-like cells were present in abundance, only a very guarded prognosis was permissible. If in such a case the osteoclast-like giant cells were focally distributed and if there were areas showing spicules of new-formed bone within the substance of the tumour, a grave prognosis must be given.

Mr. F. C. PYBUS (Newcastle-on-Tyne) gave an account of a strain of mice with a high incidence of bone sarcoma that had been bred from one original female mouse in which the occurrence of the bone sarcoma had been fortuitous.

Mr. STANFORD CADE (London) gave his opinion that in the borderline case biopsy did not give a definite diagnosis. The treatment of bone sarcomata was primarily non-surgical. The diagnosis should be by radiography and the tumour should be treated by the radiologist, who, if he did not cure the tumour, would at least have rendered it less virulent. He did not believe that surgery even extended the time during which the patient was free from metastases. Prophylactic radiation of the lungs he regarded as a bad procedure.

Mr. R. C. ELMSLIE (London) objected to two terms in Dr. Roberts's scheme for the radiological diagnosis of bone tumours. He thought it had been accepted that so-called decalcification of bone was really withdrawal of bone substance and not of calcium from the bone that remained. He wished the term osteitis fibrosa could be discarded; it was inaccurate, and at present it stood for at least four different lesions of bone. He agreed with Prof. Young about the importance of biopsy and with Prof. Stewart about the danger of immediate diagnosis. When there was a lump of bone which could not be explained the surgeon should do a biopsy; but he must send to the pathologist a good slice of the tumour chosen from the right part of it. No pathologist should be expected to give an opinion on a slide prepared by another pathologist: he required, and ought to have, a piece of the tumour.

Dr. ROBERTS, in reply, asked for a closer coöperation between the pathologist and radiologist in this matter of bone tumours.

Prof. YOUNG agreed with Dr. Brailsford that the growth of the tumour in its primary site was slowed down by internal pressure (the foot could not swell within the boot). It was *metastatic* spread that he suggested was increased by hydrostatic pressure.

SECTION OF ORTHOPÆDICS

Mr. S. T. IRWIN, president of this section, was in the chair when Mr. DENIS BROWNE (London) opened a discussion on the

Modern Treatment of Club-foot

He showed a series of photographs and cited arguments in favour of his theory of the mechanical cause of congenital deformities. Mr. Browne said that he regarded direct intra-uterine pressure on the foot as the established cause of club-foot, and saw in this conception a key to its treatment. The pressure dimples on the dorsum of the deformed foot were, in his view, caused by the uterine wall. He showed how the feet were exposed to pressure in utero by certain abnormal positions of the legs. Talipes of the hands did occur, but its infrequency was to be explained by the much more sheltered position occupied by the hands in the uterus. In manipulating the club-foot his principle was to get the foot into *full* calcaneo-valgus position and to secure the full correction at the first manipulation. It was impossible to over-correct, because in the normal new-born baby's foot the little toe could be pushed with perfect ease against the outside of the leg. In the after-treatment the mother could easily carry out the necessary manipulation. The splint he used was designed on the mechanical principle that it is possible to control the position of one foot by means of the other. The foot was held corrected in relation to the body as a whole. Pressure sores and skin irritation he regarded as unimportant and as no reason for discontinuing the splint, and he was not alarmed by a good deal of reactionary swelling after the first manipulation. The cross-bar of the splint was applied *after* both feet had been bandaged in position; the sole plate was applied first and then the leg-piece. By this means the foot was pulled into a valgus position. When operation was necessary, he directed his attention to removal of bone, and left the soft parts untouched and unstretched. By this means he hoped to prevent relapse of the deformity by elastic recoil of over-stretched tissues.

Mr. E. P. BROCKMAN (London) said that according to his hypothesis congenital club-foot resulted from an intrinsic rather than an extrinsic cause. He attributed it to a congenital dislocation of the head of the astragalus, which in turn was caused by an atresia of the socket into which the head fitted. He used the splint advocated by Mr. Denis Browne and found that it avoided nearly all the troubles he had encountered with repeated manipulation and strapping. The splint substituted a persistent slow method of correction for the misplaced hurry of much modern orthopædic technique. Of the two parts of the deformity, the equinus was the more difficult to overcome by manipulation alone. By pushing against the splint the child seemed to push the heel down. The criterion of cure was, as end-result, "a foot with no adduction or inversion; the presence of a hollow upon the outer side of the foot in the position previously occupied by a bony mass, the head of the astragalus; the ability of the child voluntarily to evert and also dorsiflex the foot well above the right angle." Open correction of the deformity, by enlarging the socket and allowing the head of the astragalus to take up its normal relation, had not given very satisfactory results. Feet that were good functionally were often ugly, and many relapsed. An arthrodesis was probably a much better operation. There was no such complication as inward rotation of the tibia, but only imperfectly corrected deformity of the foot.

Mr. T. P. MCMURRAY (Liverpool) said that he obtained excellent results by moulding the foot and applying plaster, provided that he got the cases really early. Treatment should start on the first day of life and be continued till the foot could be held voluntarily in eversion.

Mr. R. C. ELMSLIE (London) said that one of the common mistakes in operating for the equinus deformity was to over-stretch at the time of the tenotomy. The older method was better, in which the foot was put up after tenotomy in the position of equinus and gradually corrected.

Mr. ERIC LLOYD (London) said that Mr. Denis Browne's splint had revolutionised the treatment of club-foot, but it was a little difficult to use.

Mr. HARRY MACAULEY (Dublin) said that he got good results with manipulation and strapping. He thought that if the tendo Achillis was to be divided it was important to wait till the child could put the foot to the ground.

Mr. V. J. M. TAYLOR (Nottingham) attributed almost all failures to a break in the continuity of the treatment, for any cause. The possibility of relapse had always to be considered.

Mr. H. J. SEDDON (London) was strongly opposed to tenotomy; in his view the tendons must be preserved.

The PRESIDENT asked whether there were cases which refused to yield to manipulation.

Mr. BROWNE, in reply, said that he did occasionally meet intractable cases in which the feet were very stiff and the muscles much atrophied.

Mr. G. PERCIVAL MILLS (Birmingham) opened a discussion on the

Treatment of Tennis-elbow

He said that though the onset of the pain was associated with the playing of golf or tennis, or with amateur gardening, there was rarely a history of definite injury. A tender spot was found either over the radio-humeral joint, on the epicondyle, or in the extensor group of muscles. Pain was felt on grasping or gripping when the forearm was pronated; there was moreover a slight limitation of extension with the forearm prone. Mr. Mills advised manipulation only when this limitation of movement was definite. The tender point was usually over the radio-humeral joint, less frequently over the epicondyle. Under nitrous oxide anæsthesia he forced the elbow into full extension with the wrist and fingers flexed and the forearm pronated. A click might be felt as the elbow came straight, or adhesions might give way. Sometimes extension came gradually with neither click nor the breaking of adhesions. Two weeks' rest of the elbow was advisable after manipulation. Of 33 cases so treated 22 were well within a fortnight. Four others were eventually cured, and 7 cases were more or less failures. He had traced 5 cases in which manipulation had been advised by him but had not been carried out. These cases showed no evidence of spontaneous cure. Cases with muscular or epicondylar tenderness and no limitation of movement were in quite a different category. Most of them were the result of over-strain and were best treated by prolonged rest. The commoner type of case, which was curable by manipulation, was, in his opinion, due to fraying of the thin edge of the coronary ligament and the nipping of a semi-detached portion between the bones. On one occasion he had opened the radio-humeral joint and had actually found the coronary ligament frayed out. In the epicondylar type of case the effect of the manipulation might be to rupture tight bands which were painful when stretched.

Mr. K. H. PRIDIE (Bristol) said that tennis-elbow was an example of an injury in which muscle balance was upset: it was best cured by manipulation of the neck.

Mr. W. E. TUCKER (London) said that there were three main types of tennis-elbow: (1) due to tearing of the extensor radialis brevis muscle at the external epicondyle; (2) a bursitis, which was most difficult to cure; and (3) a fibrositis deep in the olecranon fossa. His experience was that manipulation was just as good without, as with, anæsthesia.

Mr. ELMSLIE said that he had contracted a tennis-elbow himself through manipulating club-feet! He thought that the toxic element was far more important than was commonly recognised.

Mr. D. MCVICKER (Belfast) agreed that there was a toxic factor. He manipulated the wrist, elbow, shoulder, and neck for tennis-elbow.

Prof. HEY GROVES (Bristol) said he had found that injection of a 2 per cent. solution of novocain gave relief from the pain. On occasion he had cut down on the tendon and freed it from the bone.

Mr. F. CROOKES (Nottingham) advised complete rest for about two weeks in acute cases. The chronic case was usually a local manifestation of generalised toxic fibrositis, and, even when relieved, was very prone to relapse.

The PRESIDENT suggested that tennis-elbow was an example of a type of injury which always caused intense pain, viz., tearing of a muscle from its bony origin with resulting periostitis.

Mr. TUCKER read a paper on

Athletic Injuries to the Knee

excluding damaged cartilage. He said that trauma to the knee-joint might be either direct or indirect. One of the most important after-effects was a wasting of the quadriceps associated with stiffness of the knee. He advised four exercises for its correction: (1) voluntary contraction of the quadriceps with the limb lying at rest; (2) raising and lowering the foot with the leg hanging over the end of the couch; (3) raising the whole leg from the hip with the knee extended; and (4) bicycling. Sponging and hot dressings were also useful, and graduated contractions. Injury to the internal lateral ligament was one of the commonest results of indirect violence. It was caused by a lateral wrench, and it was *not* commonly associated with a cartilage injury. External rotation was painful, but limitation of extension was a late symptom in untreated cases. Mild cases, treated actively by heat, massage, and graduated contractions, recovered in six days. The moderate and severe cases were associated with an actual rupture of the ligament or with avulsion of a flake of bone. Cases were treated in a plaster-of-Paris back splint with two circular bands applied over an internal pad of felt. They took 6 weeks to 6 months for recovery. Anæsthesia was useful to rule out cartilage injuries and adhesions.

External lateral ligament injuries were usually caused by direct violence, and were often complicated by injuries to the biceps tendon or to the external expansion of the quadriceps. They were treated by heat, massage, and neogalvanism. The articular pads of fat might be injured either by direct violence or by hyperextension of the joint. Pain was particularly noticed on going down stairs, and the tenderness was felt on either side of the upper end of the pætellar ligament. Wasting of the quadriceps was early and obvious. In synovitis with much fluid aspiration gave instantaneous relief of pain. The skin was incised with a tenotome and the needle entered through the lateral pouch. Weight-bearing was best avoided while pain persisted; the time of recovery varied from a few days to several months. One type of synovitis, to which middle-weight and heavy people were prone, was associated with slight arthritic changes. It was worth treating these patients thoroughly, for they got relief from symptoms for several years. Quadriceps insufficiency was of three types. When the vastus internus was mainly involved the injury was often labelled a

(*Continued at foot of next page*)

REVIEWS AND NOTICES OF BOOKS

British Encyclopædia of Medical Practice

Vol. IV. By Various Authors. Under the general editorship of Sir HUMPHRY ROLLESTON, Bart., G.C.V.O., K.C.B., M.D., D.Sc., Emeritus Professor of Physic, Cambridge. With the assistance of Prof. F. R. FRASER, M.D., F.R.C.P.; Prof. G. GREY TURNER, M.S., F.R.C.S.; Prof. JAMES YOUNG, D.S.O., M.D., F.R.C.S.E.; Sir LEONARD ROGERS, K.C.S.I., F.R.C.P., F.R.C.S., F.R.S.; and F. M. R. WALSHE, O.B.E., M.D., D.Sc., F.R.C.P. London: Butterworth and Co. 1937. Pp. 650. 35*s*.

THE fourth volume of this work, containing 42 contributions, opens with an admirably succinct article on diarrhœa by Sir Arthur Hurst, and ends, appropriately enough, with one by W. B. Gabriel on endoscopy of the rectum. N. Hamilton Fairley writes on the tropical diarrhœas and ciliate dysentery, and there are two other articles on tropical medicine; one, by Ram Nath Chopra on epidemic dropsy and one by H. Marrian Perry on bacillary dysentery. Electrodiagnosis and the various conditions amenable to treatment by diathermy are discussed by E. P. Cumberbatch, and C. B. Heald contributes an article on electrotherapy. In the neurological sphere, F. M. R. Walshe and J. G. Greenfield collaborate in an article on the clinical and pathological aspects of disseminated sclerosis in which the former expresses profound scepticism as to the curative value of any existing method of treatment. W. G. Wyllie writes on epidemic encephalitis and encephalomyelitis, and E. A. Blake Pritchard on electrical injury. General and special surgical subjects considered are dislocations by G. R. Girdlestone, Dupuytren's contracture by E. P. Brockman, empyema by A. Tudor Edwards, and dysphagia, dysphonia, and ear diseases by Lionel Colledge. Diplopia by P. G. Doyne is the only subject of ophthalmological interest to be found in this volume, and there is only one article on pædiatrics, that by R. W. B. Ellis on diarrhœa in infancy and childhood. There are four dermatological articles: on dysidrosis by J. A. Drake, on ecthyma by J. E. M. Wigley, on eczema by Arthur Whitfield, and on drug-eruptions by R. T. Brain. Several contributions are of gynæcological interest. Eardley Holland writes on dysmenorrhœa and dyspareunia, James Young on endometritis and allied conditions, and M. J. Stewart and Andrew Claye collaborate to set forth the clinical and pathological aspects of endometriosis and adenomyoma. A practical and thorough account of the methods of resuscitating the apparently drowned, by M. B. MacLeod, deserves mention. The remaining articles on medical subjects will probably be of great use to general practitioners, most of whom will sooner or later, however unwillingly, be called upon to cope with a drug addict, and E. W. Adams here gives valuable guidance. John D. Comrie's article on diet in treatment may help him to answer the oft-repeated question, "What can I eat, doctor?" Another valuable contribution is Helen Mackay's on dietetic deficiency diseases. Sir Humphry Rolleston's short note on the care of the dying is a masterpiece of common sense. Two aspects of dyspepsia are discussed by Robert Hutchison and Sir Arthur Hurst; Ronald Christie writes on dyspnœa and pulmonary emphysema; Sir Edmund Spriggs and O. A. Marxer on diverticulosis. E. H. R. Harries discusses diphtheria fully and clearly, including its prevention and treatment. Dwarfism and infantilism and the encouraging possibilities of hormone therapy in these conditions are exhaustively surveyed by H. Gardiner-Hill. Like its predecessors this fourth volume of the series is profusely illustrated.

(*Continued from previous page*)

torn cartilage. Crureus and subcrureus insufficiency was confused with injuries to the pad of fat. Insufficiency of the external vastus was often associated with a slack extensor fascia femoris. Remedial exercises were an important part of the treatment. Full manipulation should always be tried before the decision was made to remove a cartilage, but diagnostic movement under anæsthesia should be postponed for two to three weeks. Even a case with an associated cartilage injury took no harm from treatment for six weeks as a sprained knee.

Rose and Carless' Manual of Surgery

Fifteenth edition. By CECIL P. G. WAKELEY, D.Sc., F.R.C.S., F.R.S. Edin., and JOHN B. HUNTER, M.Chir., F.R.C.S. London: Baillière, Tindall and Cox. 1937. Two vols. Pp. 1618. 30*s*.

THE format of this classic in its fifteenth edition departs in two ways from precedent: the separation of the too bulky tome into two convenient volumes, and the decorations on the cover appropriate to a book published in coronation year. New matter includes a good discussion of surgical shock and a chapter on the surgery of the sympathetic nervous system detailed enough for the requirements of a candidate for the F.R.C.S. The section on chest surgery, largely rewritten by Mr. J. B. Hunter, is now well up to date, and that on brain surgery from the pen of Mr. Wilfred Willway is a great improvement. Corresponding revision is sorely needed in the sections dealing with the stomach and intestines, and with the male genital tract, for there are not only many gaps but actual mistakes which persist from previous editions. The portion of the book most open to criticism, however, is that on pathology, the opening one, by Dr. Carnegie Dickson. Since pathology must anyhow be studied as a separate subject there is really no need for this section in a text-book on surgery, but if any is included it ought to be better balanced; to introduce new bacteriological nomenclature, without correcting some of the old-standing errors and ambiguities about exostoses, myelomata, and parotid tumours, to give only three examples, is to give a false impression of up-to-dateness. The inadequate account given of odontomes and of the newer conceptions of the sarcomata serve only to confuse the inexperienced reader. It is indeed questionable whether this section should not be deleted altogether. Its replacement by a single introductory chapter indicating that surgery is based on pathology, and that a knowledge of the fundamentals of bacteriology and morbid anatomy is essential before the principles underlying surgery can be grasped, would probably give the student a better perspective. Similarly the section on gynæcological surgery is rather out of place, though the inclusion of chapters on the special departments—eyes and ears and throats—is an excellent way of reminding the student that their differentiation in hospital is merely one of convenience. The anæsthetic

section has been well revised and modernised. A number of new illustrations have been added, of which the drawings are much better than the photographs.

Abdominal Surgery of Children

Second edition. By Sir LANCELOT BARRINGTON-WARD, K.C.V.O., Ch.M., F.R.C.S. Edin., F.R.C.S. Eng., Senior Surgeon, Hospital for Sick Children, Great Ormond-street. London: Humphrey Milford, Oxford University Press. 1937. Pp. 333. 25*s*.

THIS bracing production exemplifies the orderly working of a mind which has been trained by constant contact with patients, and clearly does not regard them only as so much clinical material. The outcome of this attitude is a concise summary—without too rigid a discrimination between medicine and surgery—of the practical considerations which arise when abdominal disease attacks a child. Statements of opinion on debatable issues are supported by ample evidence derived from the Hospital for Sick Children and from private sources. The difference of 9 per cent. between the operative mortality of congenital pyloric stenosis in private and in hospital practice emphasises the appalling danger of cross-infection in open wards. Many new items have been added in this edition, including the most recent work on diaphragmatic hernia, and such well-tried but little used adjuncts to success as insulin for post-operative ketosis. There are some omissions; for example nothing is said of the injection treatment of hydrocele of the tunica vaginalis—a method which has been found peculiarly successful in the infant. More important is the deliberate omission of any account of the surgery of the urinary system; this we cannot but regard as an artificial separation, since retro-peritoneal growths have been included and the surgery of the sympathetic nervous system in the abdomen has been at least partly discussed. The phraseology is precise throughout.

The broad outlook here shown will make an appeal to all interested in the diseases of children whether their bias is medical or surgical. Pædiatric surgery is a specialty which, perhaps more than any other, demands the intimate assistance of medical knowledge—the coöperation of the understanding surgeon with the specialist physician.

Twins

A Study of Heredity and Environment. By HORATIO H. NEWMAN, FRANK N. FREEMAN, and KARL J. HOLZINGER. Chicago: University Press. 1937. Pp. 369. 18*s*.

WE have elsewhere drawn attention to the remarkable monograph on twins by Profs. Newman, Freeman, and Holzinger which is unquestionably the fullest and most scientific study of the subject which has so far been published. The authors give an adequate account of the previous literature on twins, but the greater part of the volume consists of very thorough records and statistical analysis of their own observations. The study mainly concerns psychological traits but many data are also provided on physical resemblances. The non-statistical reader will find much of the work on correlation, &c., difficult reading, but the case-histories of nineteen pairs of twins separated in infancy and reared apart are of absorbing scientific and human interest. The authors hardly exaggerate when they say that nearly every case would provide material for a good short story. The biological considerations raised by the study of twins are of wide application, and zoologists, psychologists, and sociologists as well as medical men will find this new study indispensable. The tracing of so many separated twins and the difficulties of obtaining their confidence and coöperation when found must have called not only for exceptional diligence and enthusiasm but also for sympathy and human understanding of a high order. The resulting monograph is a fine piece of natural history and one that would have rejoiced the heart of Francis Galton or Karl Pearson.

The Citadel

By A. J. CRONIN. London: Victor Gollancz. 1937. Pp. 446. 8*s*. 6*d*.

IT is probable that this book has been gravely misjudged by the public and that its author would be the first to deny that it is a picture of ordinary medical conduct in this country. The remarkable success of Dr. Cronin's previous novels suggests that his first concern is to tell an absorbing story, and only incidentally to suggest lines on which medical practice might be reformed. He shows skill as a story-teller, effectively shifting the scene from the squalid surgeries of Welsh mining villages to the dusty inactivity of a Government office and thence to a wicked world in which live successful practitioners of dubious standards. If it is fair to look for didactic purpose in a novel, we may find it epitomised in the hero's defence of himself before the General Medical Council. In this speech Dr. Manson told the tribunal that when he qualified he was a menace to society and that this ignorance on the part of the newly qualified practitioner of all but the rudiments of medicine should be remedied by the organisation of scientific units, compulsory post-graduate classes, and the bringing of science into the front line. Dr. Cronin pleads for the better payment of nurses and for placing the practitioner in a position of economic independence, and he goes on to appeal for a more liberal attitude towards those who, without medical qualifications, are fostering supposed innovations in medical practice.

He is certainly not alone among doctors in his desire for better medical education. As a business man, however, he must recognise that the problem of securing its improvement is largely an economic one. The hero of "The Citadel" was driven from his medical school as soon as he qualified by his urgent need of money to pay back a loan, and Dr. Cronin gives us no hint of how to remedy the position of the poor student. What he has not brought out is (1) the high proportion of medical students who qualify with the help of scholarships; (2) the many indications—e.g., the foundation of the British Postgraduate Medical School, the subsidy offered by the Ministry of Health to insurance practitioners who want to keep themselves up to date, the provision of studentships for the recently qualified by the Medical Research Council—that the standards achieved and maintained by doctors in this country are no longer a matter of official indifference.

The general public is not specially interested in the mechanism of medical education. The ordinary novel reader will seize with more avidity on the description of evil practices amongst unethical doctors in London. It is however from practitioners working in circumstances analogous to those of Dr. Cronin's hero that we have heard pungent criticism of this

section of his book. No man in the position of Dr. Manson, unless he were a rogue or a fool, would work with spurious consultants whose qualifications or lack of them he could easily ascertain. From one who came to London as a stranger from a provincial school we learn that he did, to his amazement, receive a cheque from the first surgeon he called in after buying his practice. The name of this surgeon had been given to him by the dispenser. He returned the cheque, ascertained from books of reference that the surgeon's credentials were not high, and troubled him no more. This calm attitude in the face of an improper proposal represents that of the average practitioner. There is no occasion to be smug about such abuses; we know they exist and that corruption in some form always will exist. A safeguard open to the stranger in a great town is to seek advice from recognised teachers of medicine and of surgery, or even in smaller places (so dependable are academic bonds) to provide himself in advance, through his former teachers, with recommendations. When, like Dr. Manson, he abandons the guidance available to him before he has accumulated his own knowledge of personnel, the results for his patients may be deplorable; that the results for himself, as far as worldly success is concerned, may be less deplorable, is an incidental evil which Dr. Cronin is not alone in regretting.

Medical Emergencies

Second edition. By CHARLES NEWMAN, M.D. Cantab., F.R.C.P. Lond., Physician and Medical Tutor, King's College Hospital; Assistant Physician, Belgrave Hospital for Children. London: J. and A. Churchill. 1937. Pp. 150. 8*s.* 6*d.*

IN this excellent little book the author deliberately gives simple dogmatic directions without alternative advice. In this edition the chapter on the treatment of poisoning has been modified and poisoning by war-gases is now included. Other new sections deal with coma in hot climates, asthma, the treatment of hæmoptysis by artificial pneumothorax, and agranulocytosis. Some good descriptions of practical methods are found in the text but a few clear illustrations would assist the reader. A very useful chapter is the one dealing with "Sudden Insanity." The problem presented by the patient who suddenly becomes insane can cause the practitioner acute anxiety and very few books offer advice of real help to him.

L'anaphylaxie expérimentale et humaine

By PASTEUR VALLERY-RADOT, G. MAURIC, et Mme HOLTZER. Paris: Masson et Cie. 1937. Pp. 130. Fr.36.

THIS can hardly lay claim to being a general monograph on anaphylaxis. Much of the book consists of an account of the authors' own experiments on anaphylaxis in the rabbit, particularly to "antigens" which play a part in human allergy, such as extracts of horse dandruff, of the hair of domestic animals, the feathers of birds, and so forth. A second part of the book is devoted to human allergy. The authors do not bring forward any striking new work; their purpose seems rather to traverse well-beaten ground, but to illustrate it in the light of their own first-hand observation. The book has the familiar gallic qualities of clarity and grace, and it succeeds in giving a fair idea of a difficult and complicated subject.

Bacteriology: A Text-book of Micro-organisms

Third edition. By FRED WILBUR TANNER, Professor of Bacteriology and Head of the Department, University of Illinois, Urbana. New York: John Wiley and Sons; London: Chapman and Hall. 1937. Pp. 510. 17*s.* 6*d.*

THIS is a book of a type more familiar in America than in British bacteriological literature—an attempt to present microbiology as a subject of general interest without overstressing any of its technical branches. Such books make attractive reading, specially when they are written, as this is, by a skilled teacher who has a wide knowledge of the subject. It is unfortunately difficult to make these books anything but superficial. The scope of microbiology is too vast and its technical applications are already too numerous to allow of a comprehensive treatment of the subject in an elementary work. Microbiology will, sooner or later, take a position among the subjects of basic education but much pedagogic skill and enterprise will be necessary before anything like an ideal presentation can be achieved. As it stands the subject is best approached through the avenues of one or other of its applied branches and such books as this serve a useful purpose in complementing knowledge so acquired and in generalising the student's bacteriological interests. Bacteriology without its pathological applications is "Hamlet" without its hero, but it is difficult for anyone not medically trained to acquire sound notions on this aspect of the subject. Even allowing for the limitations of space we do not think that the pathological side of the question is as well developed as the rest of the book. The paragraphs on the Dick test and scarlet fever are inadequate and ill-orientated. Why, for example, should we be told that "according to Zingher" the Dick reaction appears more promptly than the Schick? It needs no ghost come from the grave to tell us this. But though we can find plenty of minor faults we regard the book as offering profitable reading to anyone who wants to gain a general view of microbiology.

Laboratory Outline in Filterable Viruses

By ROSCOE R. HYDE, Professor of Immunology and Director of the Laboratories of Immunology and Filterable Viruses, Johns Hopkins University, New York. London: Macmillan and Co. 1937. Pp. 85. 7*s.* 6*d.*

Johns Hopkins must be one of the few universities possessing a department devoted to the study of viruses and instruction in this branch of microbiology. The director of this department, Prof. Roscoe R. Hyde, has written this little book as a guide to the laboratory studies of students attending his course of instruction in virus work. It is in no respect a text-book—even an elementary one—of practical virus study. Deliberately Prof. Hyde has omitted detail with the object of encouraging self-reliance on the part of the worker; this is, in fact, a bare outline of the exercises to be carried out, and will thus be of little service to those beginners who are not adequately guided by someone thoroughly versed in virus work. Whether or not the course outlined is an ideal one is open to question. It seems to us somewhat unbalanced. There is, for instance, a complete omission of the serological side of virus work, and this surely is an essential part in the training of the virus worker.

THE LANCET

LONDON: SATURDAY, SEPTEMBER 4, 1937

EVOLUTION

THERE can have been no meeting of the British Association since 1860 at which evolution has not been in the minds and on the tongues of some of the members present. It is therefore seemly and appropriate that Sir EDWARD POULTON, F.R.S., to whose scientific life natural selection has always been the guiding torch, should devote his presidential address to a consideration of the history of evolutionary thought as he has seen it at successive meetings which he has habitually attended for more than 50 years. Of any doubts about the fact of evolution he has heard but one whisper; about its causes and mechanism there is still no agreement. His most impressive memory is an address by HUXLEY (THOMAS HENRY) in 1880 on the rise and progress of palæontology, in which that master expositor showed how the truths of comparative anatomy could enrich and develop the relatively meagre records of the rocks and make credible the ups and downs of the earth seen by the geologists. Another matter which gave rise to much lively discussion was the physical possibility of the earth being as old as the biologists would like—solved in the end to the satisfaction of both parties by the discovery of radioactivity though without finding any exact figure for the age of a habitable earth. The detailed cause of evolution which has been most constantly under discussion is lamarckism or use-inheritance, with the variety which SAMUEL BUTLER called unconscious memory. DARWIN frankly accepted the possibility of its action though he thought it of far less importance than natural selection, and did not discuss it at length. For some time it was supposed that WEISMANN had finally disposed of the notion, but it has in recent years come back into some favour and, with Prof. E. W. MCBRIDE as its champion in this country, has been supported by experiments which are cogent though not perhaps conclusive. Implacable darwinian as he is, Sir EDWARD POULTON is not very sympathetic and he deals very shortly also with the idea, to which several distinguished palæontologists have been driven, that evolution is a process determined in any one of its lines from the beginning and with characteristics that an imperfect vocabulary can describe only as purposive, a point of view which the Association heard of from H. F. OSBORN himself. He recalls the antagonism which at first was supposed to exist between darwinism and mendelism by those who forgot that DARWIN accepted the occurrence of large mutations but was disinclined to consider them in detail and who did not realise that very minute differences could be inherited along mendelian lines as well as considerable ones. The whole forms a very interesting personal survey of the progress of knowledge and speculation about evolution. Evolution itself and the elimination of the majority of young animals and plants are facts of experience, but it is still very uncertain whether the one will account for the other. Perhaps the difficulty arises from searching for one cause of evolution rather than a number of mechanisms. It is characteristic of animals that they generally have more than one means of reaching an end; reproduction, for instance, may take place in a variety of ways, and though a sexual process is predominant a variety of other methods may be used to achieve a new generation. It is possible that darwinians, lamarckians, mendelians, and orthogeneticists are all more or less right. But Sir EDWARD POULTON does not think so.

WORM PARASITES MADE SELF-DISCLOSING

PERHAPS the most dramatic display of a helminthic parasite, brought about solely by its own movements, is the active passage of an adult loa across the eye under the conjunctiva. This natural activity of parasitic worms is being more and more used to make them betray their unwelcome presence. For example HALL and COLLINS[1] have used two methods to determine the presence of trichinæ in 300 human diaphragms: in the first, 1 g. of muscle was squashed between thick glass plates and put under the microscope; in the second the rest of the diaphragm, averaging 113 g., was digested in artificial gastric juice and put through a Baermann apparatus whose wire-gauze filter had 80–100 meshes to the inch. The passage of larvæ through the screen is mainly the result of their own activity, for if they fall on the wall of the funnel or on the wires of the screen they do not tend to stay there, as dead and motionless larvæ do, but slip on downwards to be collected in the funnel's stem. The evidence suggests that this apparatus detects all infections in which there are living larvæ in the sample used, and if that is a fair sample it distinguishes infective trichinous from healthy carcasses. That there is great need for such a distinction the following considerations show. Though these squash preparations missed all infections with less than one measle to the gramme (in this series 75 per cent. of all who harboured living larvæ) it did show that digestion missed 66 per cent. of those in which the larvæ were already dead; while the combination of the two examinations made it manifest that of these 300 persons 41 had suffered from trichinosis. The full implication of this will come with the realisation that the material itself was got from ten Washington hospitals whose patients came from army, navy, and civil life, from all over the United States, and were of every age, colour, and financial standing, and that in no one of them did their medical history show a previous diagnosis of trichinosis. The writers conclude that there must be several million trichinous persons in the

[1] Hall, M. C., and Collins, J., *Publ. Hlth Rep. Wash.* 1937, **52**, 468.

United States, so that the incidence there in man must be greater than in garbage-fed hogs, while its control constitutes the greatest trichinous problem in the world.

In intestinal schistosomiasis there is, it seems, a like condition so far as the possibility of its disclosure by the activity of the larval worm goes. ALLEN SCOTT[2] from 40,000 fæcal examinations made by his staff in Egypt, and from analysis of 2,000,000 others made at government treatment centres has found that 60 per cent. of those living in the north and east of the Delta have intestinal bilharzial infection, almost all with *Schistosoma mansoni*, and he estimates that the projected extension of perennial irrigation will doom at least a million more Egyptians to this infection. It is clear from a summary of the position by ROSE[3] that while treatments given mainly at government treatment centres have greatly lessened the number of serious complications in urinary schistosomiasis, they have not lessened the number of persons infected and reinfected. The incidence of *S. mansoni* does not run parallel with the local presence or absence of the intermediate host, a planorbis snail; there is some unknown factor here. But what is certain is the efficacy (and tediousness) of the treatment courses, at present by antimonials, in the killing of schistosomes; and there is no doubt, could all the infected be induced to undergo and carry through treatment, that the results would be very different. It is from this point of view that diagnosis becomes so important. In a second paper SCOTT[4] has compared the values of techniques used for detecting eggs in the fæces in this infection by dilution or by concentration, and he finds that by neither could he display all infections even after counting eggs on three slides, each with 0·005 g. of fæces diluted in decinormal caustic-soda solution, supplemented by gravity precipitation of fæces suspended in this solution or in normal saline. Further attempts have failed in his hands, and there seems little doubt that once more the power of the sieve to hold back eggs plays a part in the failure. As to the value of egg-counts as measures of worm loads, GUNAWARDANA[5] has compared the number of eggs found by this same technique in fæces taken from the rectum at autopsy with the number of hookworms got after scrupulous examination of the whole intestine. His test covered 200 examinations made on unselected bodies at the General Hospital, Colombo; the worms were all necators and there was no correlation between egg-counts and the number of worms. Two examples make this clear; in one 158 female worms produced 78,900 eggs in 1 c.cm. of fæces, in the other the numbers were 1302 and 61,600. The evidence then goes on steadily accumulating that egg-counts are no measure of worm-loads even when all eggs are passed directly into the bowel lumen, all to be voided in a day or two in the fæces. It is then unreasonable to assume that the number of schistosome eggs which ulceration of the bowel wall happens to throw into its lumen on any particular day is any measure of that posited daily by a worm, still less of the number of worms which are positing them.

The freeing of miracidia from the shell, and the use of their activity as a means of diagnosis, is dismissed by ALLEN SCOTT as not lending itself to routine examination. For intestinal infection by *Schistosoma japonicum* at least, this is not the view of ROSE. With introductions from the Health Section of the League of Nations he spent over a month in Egypt seeing all he wished to see and helped with courtesy to his aim which was to ascertain the bearing of the work in Egypt on the problem in China. He sums up the matter now under consideration by the statement that it is established in China that when microscopic examination has become negative and cure would have been held to have taken place by the Egyptian standard, it has been possible to hatch miracidia from larger quantities of stool; and that before cure is accepted there must be absence of miracidial hatching in three consecutive stool examinations. It seems reasonable to hope that there may be found the means to induce living miracidia to disclose themselves on a mass scale for the widespread diagnosis of intestinal infection caused by any of the schistosomes in any country.

[2] Scott, J. A., *Amer. J. Hyg.* 1937, **25**, 566.
[3] Rose, G., Chinese Medical Association Spec. Rep., Ser. No. 2. Shanghai. 1937.
[4] Scott, J. A., *Amer. J. Hyg.* 1937, **25**, 546.
[5] Gunawardana, S. A., *Ceylon J. Sci.* (D), 1937, **4**, 153.

SOCIAL INCIDENCE OF CANCER

THE major difference between cancer and many another disease, say tuberculosis, is our relative lack of knowledge of the factors intimately associated with it. Our recognition of the infectivity of tuberculosis is one clue to its prevention; its close associations with occupation, social status, and the standard of living are others. But it is also well known that the death-rate from cancer of certain sites rises steadily and considerably as we pass down the social scale. Clearly a determination of the reasons for this change in incidence might do much to direct us to means of prevention. In each case of cancer two obvious but fundamental questions arise: why has it occurred in a particular organ, why has it occurred in a particular person? In a valuable study recently published by E. L. KENNAWAY and N. M. KENNAWAY[1] an attempt is made to see how far we can at present answer those questions. Since probably most cases of cancer are due to several factors they propose a rough classification of five—namely, intrinsic and extrinsic factors, a localising factor, and genetic and extra-chromosomal heritable factors. Of intrinsic factors we know exceedingly little. As localising factors to carcinogenic agents several different types of processes in the body are already recognised; more, no doubt, have yet to be identified. In some forms of cancer in man there appears to be a heritable or familial character; the claim that an extra-chromosomal heritable factor has been demonstrated in mice has recently been invalidated.[2]

[1] *Acta un. int. Cancrum*, 1937, **2**, 101.
[2] See *Lancet*, August 21st, 1937, p. 455.

As regards prevention, however, the external factors must still be given pride of place. The most important instance of their effect is provided by the social distribution of cancer already referred to. The analysis made by the late Dr. T. H. C. STEVENSON of the death records of the General Register Office of England and Wales for the years 1921–23 [3] showed an abrupt contrast in the social incidence of cancer above and below the pylorus. Cancer of the lip, tongue, tonsil, stomach, larynx, and skin shows an increasing frequency as one passes down the social scale. Cancer of other organs, e.g., of the intestine and rectum, and cancer at deep-seated sites reveals little change. It is this contrast between the accessible and inaccessible sites that led STEVENSON to conclude that a large proportion of cancer mortality would be prevented if the conditions of life of all sections of society were assimilated to those of its upper ranks. As the KENNAWAYS point out, the stomach and the parts of the alimentary tract above it are most directly affected by factors of external origin—food, drink, tobacco, oral hygiene. They quote the Registrar-General's figures, and others from a more recent study of their own,[4] to show the high incidence of cancer of the upper alimentary tract upon males occupied with the supply of alcohol. One external factor of importance is suggested by these observations. Possibly the low incidence of cancer of the uterus in Jewish women, demonstrated by several workers, may depend upon similar external influences, for example the ritual washings and periods of abstention from intercourse prescribed by Jewish law, or as SAMPSON HANDLEY has suggested, a lessened exposure to bacteria and their products resulting from the circumcision of the male. With regard to this latter possibility data for a Moslem people would be of much value, for among them circumcision prevails without the Jewish hygienic ritual. The KENNAWAYS can find no satisfactory statistical evidence of this kind but they quote as suggestive hospital data from India collected by NATH and GREWAL.[5] Of Hindu female patients with cancer 1 in 2 had carcinoma of the genital tract while for Moslem women the figure was 1 in 3. Similar racial observations are concordant in showing that cancer of the penis is absent in those circumcised in infancy but may occur if the operation is postponed even for a few years. It seems that this form of cancer is dependent upon a single known factor, the presence of a prepuce. Whether the mode of action is by the development of a carcinogenic substance in the retained secretions, or by fixation of some other agent perhaps by irritation, one cannot say. The train of events leading to this malignant growth apparently starts in the early years of life and removal of the cause does not avert its final appearance in old or middle age. Similarly cancer of other sites may be predestined to occur through factors to which the body is exposed many years earlier. The KENNAWAYS point out that this idea suggests interesting possibilities of the prophylaxis of cancer by attention to the hygiene of youth. Cancer of the scrotum also appears to be a form wholly dependent upon external factors. Amongst the 1486 fatal cases occurring in England and Wales in the twenty-five years 1911–35, none related to a member of the professional classes and none was reported from a non-industrial county. Comparing the age-distribution of a form of cancer with a known agent, for example mule-spinners' cancer, with the distribution of the ordinary forms of cancer with unknown agents, the KENNAWAYS find a correspondence compatible with the view that these different forms are caused by similar processes of exposure to similar agents.

In addition to much other material they bring together data on the relation between the total incidence and the incubation period of cancer. A much more intensive stimulus is required, they find, to shorten the latter than is necessary to increase the former. The incubation period seems to be especially under the influence of genetic factors. For example the average age at death from cancer of the scrotum is almost the same in chimney sweeps as it is in the general population, although the special liability among sweeps to this form is enormously greater than it is in most other occupations. Even the extremely high incidence of cancer of the lung among the miners of Scheesberg and Joachimstal is not associated with death at a very early age. On the other hand some forms of cancer in which a genetic factor is concerned, for example cancer of the colon and rectum in families showing polyposis intestini, lead to death at an age which is on the average much earlier than that seen in subjects of similar forms of cancer in the general population. In total the KENNAWAYS have brought together and discussed very clearly a great deal of valuable information. On the most cogent point—the social distribution of the disease—it will be intensely interesting to see how far the differential incidence is affected by the improvement in cleanliness and the levelling of other social conditions which has taken place since 1921. For the necessary statistics we must continue to wait patiently for the Registrar-General's analysis of the occupational mortality experienced in the years 1930-32, the results of which should soon be available. It is possible that these more recent figures may give some clue to the origin of the social incidence of cancer.

[3] Registrar-General's Decennial Supplement: Occupational Mortality, 1927.

[4] *J. Hyg. Camb.* 1936, **36**, 236.

[5] Nath, V., and Grewal, K. S., *Indian J. med. Res.* 1935–36, **23**, 149.

ADVERTISEMENT OF LOCAL HEALTH SERVICES.—The Minister of Health, Sir Kingsley Wood, has arranged with the coöperation of the Postmaster-General to provide information in post offices about the public health services available in the locality. Every post office will display a notice stating that particulars can be obtained at the counter about the health services in the district, including the addresses of the antenatal clinics and child welfare centres, municipal or voluntary, and the times at which they are open. Information will also be given about such matters as the way to get an ambulance, the addresses of the medical officer of health and the vaccination officer, and the out-patient hours of the local hospitals. Information about medical benefit under the National Health Insurance scheme will continue to be available.

ANNOTATIONS

THE ASSIMILATION OF IRON

DURING recent years much has been done to establish on a satisfactory basis the treatment of iron-deficiency anæmia in the adult. Ferrous salts are put up in convenient form; the appropriate dosage of different salts is easily ascertained and the large doses required if ferric salts are used is now generally realised. The position with infants and young children, however, is different. Since capsules and pills are unsuitable, and solutions of ferrous salts are usually unstable, ferric salts are chiefly used, often in quite inadequate dosage. Though large doses of iron and ammonium citrate are well tolerated by babies if, say, a week is taken to work up to the required dose, the sudden administration of a full dose often produces colic and sometimes diarrhœa, which naturally enough upsets the parent as well as the child. On another page Dr. Helen Mackay supplies evidence that the addition of dilute hypophosphorous acid increases the stability of a solution of a ferrous salt. The mixture remains stable at room temperature for well over a month and has proved satisfactory for the treatment of anæmia in babies. The supply of ferrous salts in stable solution, effective in comparatively small amounts, should do much to promote adequate treatment of anæmia in babies. Under the name of Ferro 66, the Fabrik Promonto have issued for trial a solution containing 50 mg. of ferrous iron per c.cm., say 2·5 mg. per drop, and Glanzmann [1] in Switzerland and Stolleis [2] in Germany have been testing it. Ferro 66 is ferrous chloride dissolved in a solution of ascorbic acid which protects the ferrous salt from oxidation, so that the solution can be kept for about 3 months. Stolleis treated 25 patients of ages 2 months to 7 years. They were all diagnosed as cases of iron deficiency and included "post infection" anæmias and a case of von Jaksch's anæmia. The dose given to infants was 0·5 to 1 c.cm. of the drug (25 to 50 mg. of iron) daily, and 0·5 c.cm. was found as effective as double the amount. It was given in fluids such as milk and tea, because the concentrated solution stained the teeth. The three youngest babies were gradually worked up to the full dose. The drug was well tolerated by the 6 out-patients treated. Among the 19 in-patients, who because of their intercurrent illnesses often had digestive disturbances, administration of the drug had to be stopped or interrupted in 3 who had loose stools or vomiting. Stolleis records in some cases a reticulocyte response, with a sharp rise of red cells in only 8 to 14 days "to normal or above," and a gradual rise of hæmoglobin to normal. The period of treatment was generally two to four weeks; in 2 cases eight weeks, and in 2 others with intercurrent infections four months. These results seem remarkably rapid, but details are available of only a few cases. Glanzmann's four published cases include examples of anæmia due to iron deficiency alone; of acholuric jaundice; and of anæmia in cœliac disease, which last he treated with liver and Ferro 66 with excellent results. He gives no details of any series of cases of uncomplicated iron deficiency. He suggests that vitamin C plays a similar rôle in iron assimilation to that played by vitamin D in phosphorus and calcium metabolism, and, if the results obtainable with Ferro 66 prove superior to those obtained with other ferrous salts, the question will arise whether the ascorbic acid has some function other than that of protecting the ferrous iron from oxidation. It is to be hoped that Ferro 66 will soon be available for trial in this country.

[1] Glanzmann, E., *Schweiz. med. Wschr.* 1937, **67**, 436.
[2] Stolleis, D., *Dtsch. med. Wschr.* 1937, **63**, 819.

TWINS

IDENTICAL twins, individuals derived from a single ovum and carrying, it may be supposed, the same determinants of heredity, have long attracted the attention of psychologists. Francis Galton in his "Inquiries into Human Faculty" published in 1883 was the first to make a scientific study of the mentality of identical twins realising that the outcome might well prove critical to his infant science of eugenics. We have had to wait, however, for a really comprehensive scientific investigation of the mental and other peculiarities of twins; the discussions of the subject in standard works on psychology are mostly trivial and quite inadequate. Up to about 1930 contributions to the study of twins were infrequent and relatively unimportant, though Thorndike, Merriman, Lauterbach, Wingfield, and Hirsch each added something to our knowledge. During the last half-dozen years there has been considerable progress, above all that represented by the painstaking work of Prof. Horatio Newman of Chicago. Himself a zoologist, Prof. Newman has collaborated with colleagues, F. N. Freeman and K. J. Holzinger, who hold chairs respectively in psychology and statistics to produce a summary of what is known of the peculiarities of twins, and their study [1] includes a full record and analysis of their own extensive work. The claim that this is "the first thorough study" in the field may be allowed without reservation. The centrepiece of the book is a study of 19 pairs of identical twins who were separated in infancy and reared apart. The special value of such material for the study of the relative importance of heredity and environment in the determination of human personality and behaviour is so obvious that it is astonishing that no such study of a series of separately nurtured identical twins had previously been undertaken. The authors themselves admit that they have failed to find any simple solution for the nature-nurture problem, but the wealth of interesting and carefully analysed material makes a real storehouse for all future workers. As might have been expected the analyses showed that identical twins were much more alike than fraternal twins in most of the traits measured. This was true of physical dimensions, intelligence tests, and educational achievement. On the other hand, the divergency between twins in "personality" was sometimes considerable. Galton's view was confirmed that handwriting is a highly individual character, and this is evident even to the inexpert who examines the many examples of the writing of twins given in the book. Only two of the nineteen pairs of twins reared apart had handwriting that was difficult to distinguish.

A puzzling feature in twins is the reversed symmetry commonly shown by such characters as "handedness," the palmar skin pattern, and the arrangement of hair or teeth. For example among 241 pairs of identical twins both were right-handed in 166 instances (68·9 per cent.) and there was one right-handed and one left-handed in 58 instances (24·1 per cent.). This reversal might be plausibly

[1] Twins. A Study of Heredity and Environment. By Horatio H. Newman, Frank N. Freeman, and Karl J. Holzinger. Chicago: The University of Chicago Press. 1937. Pp. 369. 18*s*.

explained by the view that one twin had been derived from a partially differentiated right and the other from a partially differentiated left embryo, but this does not explain the high reversal findings among fraternal twins. Among 274 pairs of fraternal twins 229 pairs (83·6 per cent.) were right-handed and 41 (15 per cent.) had one right-handed and one left-handed member. No satisfactory theory for this relatively high percentage of reversals in fraternal twins is forthcoming.

The otherwise proud possessors of twins are sometimes haunted by the thought that their offspring may have to split between them a single quantum of intelligence. This study is entirely reassuring on the point. Twins were found to be normal in intelligence and educational acquirements; they were neither superior nor inferior to people in general. If a general conclusion can be drawn from this monograph it is that there exist forms of behaviour which are determined largely by heredity, but that all of these are susceptible to environmental influence. As H. S. Jennings has broadly put it, "What heredity can do environment can do also."

ADIE'S SYNDROME

In 1932 Adie published in *Brain* a communication on a benign disorder, sui generis, in which tonic pupils and absent tendon reflexes presented a clinical picture which he distinguished from that of tabes and the Argyll Robertson pupil. Though he was careful to give Nonne and others due credit for their work in the same field, his communication was so complete and well documented that the condition he described has since been known as Adie's syndrome. His belief that it is far from rare has been confirmed in various quarters. In 1936 Müller collected more than 100 cases, and now G. Bergmark [1] of Upsala has just published 16 cases of his own. Adie's syndrome should in his view be regarded rather as a curious cosmetic blemish than as a serious disorder requiring or responsive to treatment. To overlook it matters little. What matters much more is to misinterpret it as a manifestation of late syphilis requiring specific treatment with the object of averting or curing tabes. The abnormalities of the pupils are the salient features of this syndrome. On one side, seldom on both sides, the reaction of the pupil to light is absent or defective; on accommodation to near vision there is a myotonic reaction characterised by a comparatively slow contraction of the pupil which, in some cases, makes up for this slowness by contracting more completely than its fellow. When the effort to accommodate to near vision is relaxed, the pupil on the affected side dilates more slowly than its fellow; but ultimately the affected pupil may become much the wider of the two. Included in the syndrome is the absence of one or more tendon or periosteal reflexes. There are no motor or sensory disturbances, no other demonstrable abnormality of the nervous system, and nothing amiss with the cerebro-spinal fluid whose reaction to the Wassermann test is negative, as is also that of the blood. The syndrome is often discovered by accident, and this was the case with as many as 7 of Bergmark's 16 cases. Only 5 of his patients were males, and in Müller's collection there were approximately twice as many women as men. In the rare cases in which the ocular condition is bilateral, the abnormalities are usually more pronounced on one side than on the other. This condition may begin in early childhood, and its development seems to come to an early stop, the patient's condition remaining unchanged over a period of many years. Discussing the ætiology, Bergmark dismisses syphilis as a negligible factor even in the cases with a history of it unassociated with a positive Wassermann reaction. He is also sceptical as to the part played by epidemic encephalitis; in none of his cases was there any evidence of parkinsonism. But there was one definite as well as one probable case of epidemic poliomyelitis in his series. In a condition whose ætiology is unknown and whose treatment futile, the most important consideration to be borne in mind is that the syndrome is a common complaint whose confusion with syphilis of the central nervous system may do the patient serious harm in more ways than one.

[1] *Nord. med. Tidskr.* July 24th, 1937, p. 1169.

SAFE CATGUT

The Therapeutic Substances (Amendment) Regulations, 1937, just issued by the Ministry of Health with an accompanying circular (No. 1641) will be of interest to all medical men engaged in surgical work, whether surgical specialists or general practitioners. Last September we drew attention to the circular (No. 1563) issued by the Ministry of Health to local authorities asking them to make sure that the catgut used in the hospitals for which they are responsible did not carry any risk of conveying infection. This circular accompanied a memorandum (199 Med.) on sterilised surgical catgut, on the lines of the paper read by Sir Weldon Dalrymple-Champneys to the Royal Society of Medicine eighteen months ago,[1] in which the nature and methods of manufacture and sterilisation of surgical catgut were described and reference was made to 9 recent cases of post-operative tetanus (5 of which proved fatal) in which the evidence pointed very strongly to "home-cured" catgut as the source of infection. The new regulations carry the matter a step further by requiring that "every container of and wrapper enclosing surgical ligature or suture other than a ligature or suture offered or intended to be offered for sale as sterile shall bear a label on which are printed or written in a conspicuous manner in indelible red ink the words 'non-sterile surgical ligature (suture)—not to be used for operations upon the human body unless efficiently sterilised.'" A hospital or practitioner will still be at liberty to use any method of sterilising catgut for their own use which they may think fit (the Therapeutic Substances Act and Regulations only governing surgical catgut offered or intended to be offered for sale), but they will now be warned by the label on raw or "partially sterilised" catgut that such material requires efficient sterilisation before use. The Ministry hopes in this way to remove the false sense of security which they have reason to believe has sometimes been given by the descriptions "partially sterilised" or "internally sterile," and may have led to such disasters as were referred to in their previous memorandum. We understand, by the way, that as a result of Sir Weldon's paper to which we have already referred and Memorandum 199 Med. a number of hospitals which sterilised their own surgical catgut have gone very carefully into the methods used and have either abandoned sterilisation in favour of the purchase of catgut made under the Ministry's licence or have modified their procedure so as to ensure its safety.

The efficient sterilisation of surgical catgut has also been exercising the minds of the American Medical Association, which recently instituted an investigation into the sterility of catgut sutures on the American

[1] *Proc. R. Soc. Med.* 1936, **29**, 35.

market. The results of this investigation, which was carried out by Dr. J. H. Brewer of Johns Hopkins University, were published in February of this year.[2] In this investigation 1020 sutures were examined by the method of Meleney and Chatfield[3] with modifications suggested by R. O. Clock or introduced by Dr. Brewer and his co-workers, and 30 of these sutures (i.e., 3·0 per cent.) were found to be non-sterile. These non-sterile sutures were derived from 6 of the 14 firms represented—i.e., 43 per cent. of the firms whose products were tested were responsible for a non-sterile product. When, however, only sutures of recent manufacture were considered the proportion of firms placing non-sterile products on the market dropped from 43 to 12·5, and Dr. Brewer attributes this improvement largely to the influence exerted by the publications of Meleney and Chatfield and of Clock.

It will be remembered that in the Ministry of Health's memorandum Clock's conclusion that "heat sterilisation properly controlled is the only safe and positive method for sterilising surgical catgut sutures" is characterised as "an extreme view," and as surgical catgut sterilised by other methods is still licensed by the Ministry under the Therapeutic Substances Act it is obvious that their attitude in this respect is unchanged. The American investigations just described do not in fact provide evidence of the justice of Clock's contention, for only one of the firms whose products were tested used other than heat methods (firm No. 9), the method in this case being described as "heat or chemical."

INDIA'S QUININE PROBLEM

SOME ten years ago Sir Henry Gidney, speaking in the Indian Legislative Assembly, said that if all the dead bodies of malaria patients were placed side by side they would extend from the north to the south of India. Translated into less ghoulish expression, the annual mortality in India from this disease averages two millions, a staggering figure even in a population of over three hundred million people, 30 per cent. of whom suffer from the disease. At a meeting of the Central Advisory Health Board held last June, over which the Viceroy presided, Sir Henry blamed the authorities for their neglect to tackle this problem. "We pay too much attention," he said, "to the wealth of India and too little to its health." In his view the death-roll from malaria could be greatly diminished if a wise quinine policy were adopted and strictly administered. Up till now no antimalarial drug had been found which was so effective, and at the same time so inexpensive, as quinine. For the purpose of mass treatment he estimated the amount of quinine required at 9½ million ounces a year, whereas the actual annual consumption was less than 3¼ millions. Two-thirds of the malaria-stricken people of India go without quinine. If the Government of India were itself to manufacture all the quinine required by the population, and to control the profit on its sale, this enforced abstinence would cease. At present less than one-third of India's annual consumption of quinine is produced in Government factories in Bengal and Madras and the balance is imported from abroad chiefly under a contract with Java. According to the Bengal Government report for 1935–36, the manufacturing cost per pound is Rs.6·5, the present Government selling price being about Rs.18 per lb. "This profit," Sir Henry remarks, "is being secured at the expense of thousands of malaria dead." Taking the cost per ounce at the Bengal factories as 6½*d.*, the Government sells it at 1*s.* 8½*d.* and the convention of makers at 2*s.* 2*d.* in bulk lots. The difficulty is that India, like the rest of the world, will have to continue willy-nilly for some years to come to pay tribute to Java for its supplies of cinchona bark and quinine. In Formosa immense areas of cinchona trees have been put under cultivation, and in a few years' time Japan will be able to meet all her own domestic requirements. In India before large-scale and economic production can be begun it will be necessary to choose the species of cinchona yielding the highest percentage of quinine and to select the best soil for cultivation. It may be ten years before India, even if she starts to work at once, can hope to produce all the quinine her population needs, but in the meantime it should be possible to overhaul existing contracts. It is a health rather than a fiscal problem.

DANGEROUS INFECTIONS OF THE FACE

RAPID intracranial spread of infection with fatal septicæmia is a danger which we have learned to associate with apparently minor inflammatory lesions of the lips and nose. Yet, as Urban Maes points out,[1] few surgeons in the practice of a life-time see enough cases to arrive at conclusions based on their own experience. The progress of an individual case may be so disastrous that it makes a deep impression, and whether the patient dies or recovers, the surgeon is apt to formulate rules for treatment based on what was done or left undone in that case. Maes reviews the literature on the subject of infections of the "dangerous area" of the face, starting with Ludlow's original description in 1852 of "a local mischief upon which constitutional symptoms may supervene." He follows this with a summary of the clinical histories of 20 fatal cases and of 4 cases with recovery occurring in the last nine years in the practice of two hospitals in New Orleans. He reaches two definite conclusions: (1) in a very large proportion of fatal cases trauma, whether introduced by the patients' meddling fingers or by the efforts of the surgeon, is a contributing factor; and (2) local rest of the affected part, and absence of surgical interference with the lesion, give the best hope of recovery.

The "dangerous area" of the face is the triangle which extends roughly from the angles of the mouth to the bridge of the nose. The skin of the face is thin, and in this area it has underlying it a rich plexus of veins embedded in an unusually small amount of cellular tissue and in an unusually large amount of connective tissue. The fibres of the muscles of expression are superficial, and around the lips they are attached to the skin, making any degree of immobility difficult to insure. When the lesion is squeezed or scratched by the patient, or is probed or incised by the surgeon, one of the small veins is almost certain to be injured. The angular vein, which is the upward continuation of the facial vein, communicates directly with the veins of the lip and with the ophthalmic veins; they in their turn open into the cavernous sinus, and the facial vein has no valves. Thus this region of the face which is particularly exposed and susceptible to trauma is also anatomically designed to allow ready passage of infection to vital parts.

The infecting organism is usually the *Staphylococcus aureus*, and a positive blood culture can gener-

[2] *J. Amer. med. Ass.* 1937, **108**, 722.
[3] *Surg. Gynec. Obstet.* 1931, **52**, 430; *Ibid*, 1933, **56**, 149.

[1] *Ann. Surg.* July, 1937, p. 1.

ally be obtained. The mischief starts typically as an unimportant lesion, such as a furuncle, in a young vigorous adult, and the illness has a brief course. The initial mild discomfort is followed by increasingly severe pain, with red or purple discoloration of the part, and œdema and induration of the tissues. Shivering and hyperpyrexia follow as the infection spreads around the orbit and on to the forehead. Exophthalmus may be present as alarming evidence of cavernous sinus involvement. Death is usually by coma, and post-mortem examination will show thrombophlebitis, thrombosis of the cavernous sinus, meningitis, and metastatic abscesses. When patients recover after incision of the primary lesion Maes believes with others [2] that it is in spite of, rather than by virtue of, the treatment; and very pertinent is his observation that he has never seen a fatal case in which some form of trauma was not a factor. Rest in bed is advised for all but the mildest cases and local treatment restricted to the simplest measures. Talking and laughing are forbidden, and the movements of the mouth even in taking nourishment are restricted. Strapping has probably some effect in immobilising the facial muscles. Maes favours spirit compresses. The suggestion of tying the angular vein at the side of the nose is logical enough, but this is impracticable in all early cases, and once the infection has reached the veins it will probably be too late. An occasional success in saving life has followed drainage of the cavernous sinus, with or without removal of the eye, but once general spread has started we are dealing with a desperate condition and treatment is of little avail. The potential danger of all septic lesions around the lips and nose must be accepted from the outset, and not only patients but their doctors must be made to realise that squeezing, probing, and cutting seriously increase that danger.

FINANCIAL ASSISTANCE FOR COLONIAL HEALTH SCHEMES

THE organisation of the treatment of venereal diseases in Jamaica, the construction of a tuberculosis sanatorium in Cyprus, where this disease is widespread, and the extension of the medical services of Northern Rhodesia are among the schemes to be supported this year by grants from the Colonial Development Fund. The purpose of this fund is to assist by free grants or loans at low rates of interest developments recommended by Colonial Governments for the improvement of amenities in their territories. Since its inception in 1929 nearly 4½ million pounds have been issued for these purposes, mostly spent in the encouragement of local industries. As regards public health, the fund is intended to support not purely curative work, but only schemes designed to attack conditions leading to the spread of disease and to improve the general health of the community. In the current year the advisory committee of the fund has recommended [3] free grants of £19,000 per annum for five years towards the cost of an attempt to control sleeping sickness in Nigeria, where this disease is assuming alarming proportions owing to increasing migration to small rural villages, and greater facilities for trade and travel. Mass surveys are to be carried out, and the treatment of 100,000 patients per annum is planned. An effort will be made by an extensive system of clearing and re-settlement in tsetse-free areas to prevent reinfection. Grants are also to be made for the continuation of Dr. J. F. Corson's study of this disease in Tanganyika; he is investigating the relation of human trypanosomiasis to the disease in domestic animals in a wild state, and the part which may be played by such animals as reservoirs of infection. In Sierra Leone help is to be given towards the cost of constructing a maternity hospital and infant welfare centre at Freetown, and the training of native midwives and health workers to work in the Protectorate. At present midwifery is in the hands of untrained native midwives, and, in spite of a high infant mortality-rate, infant welfare work is confined to that which can be provided by overworked medical officers and the staffs of one or two mission hospitals.

[2] See *Lancet*, 1935, **1**, 507 and 1109.

[3] Colonial Development Advisory Committee. Eighth Annual Report. London: H.M. Stationery Office. Pp. 32. 6*d*.

A FRIEND IN DAVOS

THE death on August 18th of Mr. W. G. Lockett, British Consul for the Grisons, removes a figure familiar to British residents in Switzerland for the last thirty years. Lockett had made some mark as a journalist before he was invalided to Davos at a time when John Addington Symonds was still living at AmHof and Robert Louis Stevenson was playing at tin soldiers with his stepson in the attic of AmStein. He soon started an English edition of the *Davoser Blätter*, which was known as the *Davos Courier*, and circulated in the English colony and among ex-patients after their return home, and collaborated with that brilliant caricaturist Urquhart in a series of pamphlets and magazine articles featuring the development of alpine sport with the gradual decline of skating and bob-sleighing and the dawn of the new era of ski-running. All this time Lockett was available for help or advice on the problems of residence abroad and was able to adjust many difficulties at the stage of prophylaxis. He was local secretary of the Queen Alexandra Sanatorium Fund which worked so smoothly and efficiently under his supervision. The last year or two in which a considerable number of children have been sent to Davos under the ægis of the fund were joyful years to Lockett, for he was devoted to children and they returned his affection.

NATIONAL FOOD POLICIES

LEAGUE experts in their final report [1] proffer evidence that a sound and positive nutrition policy can benefit a nation's health and prosperity. The report explains simply the broad outlines of good nutrition and the special needs of different age-groups and then goes on to show how consumption has increased and changed in recent decades. The changes are almost entirely for the better and in the report are made examples of how alterations in feeding habits are brought about. Sometimes they have been due to propaganda, sometimes to greater accessibility, and sometimes to temporary cheapness which has made people used to buying an article. This happened for instance with bananas, and a mechanism which has happened once can be used deliberately again. The report points out how the changes arise partly from, and have their repercussions on, agriculture and then analyses some of the factors causing the changes; it is shown how scientific study could assist in using the lessons of the past for better policies in the future, more particularly in regard to agriculture and tariffs. Agriculture has adapted itself fairly successfully, although with some difficulty, during the past 25 years to the changes in the structure of demand, especially

[1] Final report of the mixed committee of the League of Nations on the Relation of Nutrition to Health, Agriculture, and Economic Policy. London: George Allen and Unwin. 7*s*. 6*d*.

where prices have been tempting. Changes in the future are likely to be steady, but they could be hastened to the benefit of the consumer and made more profitable to agriculture by suitable official support. In particular, agricultural adaptation could be helped by readier access to capital; the purchase of machinery and means of storage, the cost of waiting for fruit trees to mature, and other expenses of changing a farm's produce, all need credit which has hitherto been more easily obtained by industry and commerce than by agriculture. Modern methods of storage which allow of the spreading over of supplies of perishable goods should reduce the risks inherent in farming and bring agricultural insurance within the realm of practical politics. The report touches on the complicated subject of tariffs and production. While small tariffs may be genuinely useful, the higher ones prevailing recently are viewed with grave misgiving; for one reason, the adaptation of agriculture may be impeded as well as facilitated by State action. Tariffs, if excessive, may so affect prices as to draw farmers into the production of food for which the demand is shrinking. Subsidies to consumption on the other hand may provide assistance equally valuable to agriculture. Another reason is the high price at which food may be sold where tariffs are high. Although the high price may not reduce the sale of a particular commodity, the purchasing power remaining for others is reduced and must impair nutrition. The report gives a table of comparative prices of certain foodstuffs in several countries; the differences between neighbouring States is often conspicuous and the report suggests that in any country where the price of a valuable food is disproportionately high its government should consider carefully whether there is any imperative reason for depriving its people of the advantages of cheaper supply enjoyed elsewhere. At present this remark applies principally to France, Germany, Italy, Czechoslovakia, and Switzerland.

THE AQUEOUS HUMOUR AS A SECRETION

WHETHER the aqueous humour is a secretion, transudate, exudate, or dialysate is a problem which has given rise to much controversy in recent years among pathologists, anatomists, and ophthalmologists alike. The interest has chiefly centred around the first and the last of these theories. Mainly through the work of T. Leber towards the end of the last century, the secretory theory received a great measure of support; but with the introduction of more modern methods of chemical analysis the pendulum has swung in favour of dialysis. This view has been based on a study of the chemical equilibrium between blood plasma and aqueous humour, the altered constitution of the aqueous humour forming after paracentesis of the anterior chamber, and the alteration in the level of the intraocular pressure following variations in the osmotic pressure of the blood plasma. The fact that the older adherents of the dialysis theory maintained that the aqueous humour was stagnant, while others postulated a circulation with its origin at the ciliary body and its exit through the canal of Schlemm at the angle of the anterior chamber complicated the position, since the strong evidence in support of the theory that a through-and-through circulation is indeed maintained is accepted by modern exponents of the dialysis theory. The rate of flow of the aqueous humour has been estimated to be in the region of 1·0 to 2·0 c.mm. per minute or 0·2 to 0·4 per cent. of the volume of aqueous; and the question arises whether the theory of dialysis is compatible with such a rate of flow. Friedenwald and Pierce (1931, 1932) have tried to show that the rate of diffusion of crystalloids exceeds that of the flow of the aqueous. Robertson (1937) has recently analysed the evidence adduced in support of the dialysis theory. It rests on (1) the alleged absence of expenditure of energy in the production of aqueous humour; (2) a chemical equilibrium whereby non-electrolytes such as urea, sugar, uric acid, creatinine are equally distributed, and electrolytes such as chloride, sulphate, phosphate, sodium, potassium are distributed in accordance with the Donnan equation; (3) the chemical constitution of the aqueous humour which forms after paracentesis; (4) the isotonicity of the aqueous; and (5) the preservation of the level of the intraocular pressure by a balance between the capillary hydrostatic pressure minus the difference in osmotic pressure of the aqueous and capillary plasma. Robertson maintains that there must necessarily be an expenditure of energy in the production of the aqueous, because the membrane of the posterior chamber has an irreversible permeability. Recent work by A. M. Walker (1933) moreover suggests that the chemical equilibrium cannot altogether be explained by a Donnan equilibrium. Robertson finds no convincing evidence that the chemical constitution of the aqueous which forms after paracentesis is compatible with dialysis; the isotonicity of the aqueous is, in his view, no argument in favour of dialysis. Lastly, his own experimental and clinical observations do not confirm the suggested mechanism for the preservation of the intraocular pressure. He carried out observations on the intraocular pressure of patients suffering from nephritis with gross œdema in whom the osmotic pressure of the plasma proteins had fallen from a normal of 30 mm. Hg to 7 mm. These patients were followed throughout the period of their convalescence when œdema disappeared and the plasma proteins had reached normal limits. In no case was there any disturbance of the intraocular pressure. His general conclusions are that the evidence in favour of dialysis for the production of the aqueous humour is unconvincing and that the older theory of a secretion is more likely to be true.

Prof. A. W. FALCONER is to succeed Sir Carruthers Beattie at the end of the year as vice-chancellor of Capetown University. Dr. Falconer, who graduated from Aberdeen in 1901, now occupies the chair of medicine in the university.

NEXT year when Prof. R. E. PRIESTLEY vacates the vice-chancellorship of Melbourne University he may succeed Sir Charles Robertson when he retires from the same position at Birmingham. Prof. Priestley, who was geologist to the Shackleton Antarctic Expedition of 1907–09, was at one time secretary-general of the faculties to the University of Cambridge.

Prof. MAX THOREK of Chicago will deliver a lecture on Tubo-valvular Gastrostomy at the British Postgraduate Medical School (University of London) at 3 P.M. on Wednesday, Sept. 8th.

THE War Office has officially announced the formation of a Territorial Royal Army Medical Corps centre in Bristol. The centre will be known as the 2nd Southern General Hospital and, in emergency, Bristol Royal Infirmary would be adapted for this purpose as in the European War.

PANEL AND CONTRACT PRACTICE

INCAPACITY FOR WORK

THE series of studies and reports on social insurance issued by the International Labour Office has lately received a notable addition in a monograph,[1] the fourteenth of the series, on the evaluation of permanent incapacity for work. The subject is of basic importance in the administration of workmen's compensation, and of the invalidity insurance schemes in operation in Europe and elsewhere. In this country there is no separate invalidity insurance scheme, but in many cases the disablement benefit of the health insurance system fulfils the purpose of an invalidity pension, and this volume will be found full of interest to British insurance doctors and administrators. It is rich in information, and the subject matter is so well arranged that the reader has no difficulty in finding his way about and picking out what he wants.

The book gives a critical account of the methods employed in a large number of countries to define and evaluate, for purposes of workmen's compensation and invalidity insurance, permanent incapacity for work; and whatever may be the legal terminology adopted, "permanent" incapacity in practice merely means incapacity of a more or less persistent kind. The evaluation of permanent incapacity is not regarded as a process resulting in the creation of lifelong rights, and the first evaluation is therefore subject to review. There are three conceptions of incapacity: (1) physical invalidity, (2) occupational incapacity, (3) general incapacity for work, and each has its own methods of evaluation.

PHYSICAL INVALIDITY

In evaluating physical invalidity no account is taken of the economic consequences to the worker of his infirmities. The capacity of a normal worker is taken to be equivalent to 100, and the evaluation in a given case is made by reference to a schedule of injuries and infirmities to each of which a percentage of incapacity is attached. In the workmen's compensation laws of Italy, Japan, U.S.A. (except New Hampshire and California), and Australia (except New South Wales) the percentages are fixed by law and cannot be varied, but in other countries they merely serve as a guide to the authorities determining the question of incapacity. The percentages vary in different countries. For example, loss of the right hand is held to give rise to 70 per cent. incapacity in Australia, 55 per cent. in Japan, 42·5 per cent. in the Union of South Africa, and 30 per cent. in Connecticut. The use of incapacity schedules has certain advantages. It reduces the need for expert evidence to a minimum and enables evaluation in many cases to be done quickly and without disputes, and where wages are low quick settlement of claims is obviously an important consideration. But there are serious disadvantages. The degree of incapacity and consequent economic loss caused by a given injury may vary widely with the occupation usually followed by the disabled worker, his age, and other factors; and an award that would be welcomed in the case of one worker might reasonably be regarded as inadequate in another. Schedules are used chiefly in workmen's compensation cases; in invalidity insurance other methods are generally preferred.

OCCUPATIONAL INCAPACITY

In evaluating occupational incapacity, the question for determination is whether the claimant has been deprived of earning capacity not for all occupations but for some particular occupation or group of occupations. This criterion is mainly employed in countries having a special insurance scheme for salaried employees only. Such schemes aim at preserving the disabled member's social and economic status. In Germany it has been held that a decorator exercising an "Industrial art" cannot be required to take up office work, or a skilled dancer to accept a post as "walker on." The field in which this criterion applies varies with the number of the occupations covered by the respective special insurance schemes, and where the number is small invalidity pensions may be awarded to persons who could with little difficulty find new employment in an occupation not falling within the special insurance scheme.

In Great Britain, where the health insurance scheme applies to non-manual workers earning salaries not exceeding £250 a year as well as to manual workers, benefit is payable to an insured person who is incapable of following his ordinary occupation, though not necessarily incapable of other work, if it is probable that he will within a reasonable time be able to resume his ordinary occupation; it is held that in such a case it would be unreasonable to expect the worker to seek other employment.

GENERAL INCAPACITY FOR WORK

Under the conception of "general incapacity" account is taken of the possibility that the claimant though unable to do his ordinary work may be able to do other work that may reasonably be regarded as open to him. This is the most usual criterion. The definition of incapacity most generally adopted for invalidity insurance purposes is that first laid down in Section 1254 of the German social insurance code:

> "A person shall be deemed to be disabled if he is no longer capable of earning in any employment suited to his strength and ability which can reasonably be assigned to him in view of his training and previous occupation, one-third of the sum usually earned by a physically and mentally sound person of the same kind with similar training in the same district."

Under this definition an insured person may not be required to take up work which on account of his infirmity, or on other grounds, would be dangerous for him to attempt. Nor could a person insured as a wage-earner be required to set up in business on his own account, or any person to accept employment at a great distance from his home. But the application of this, or any, definition to a particular case may give rise to serious difficulty particularly in invalidity insurance; in workmen's compensation the problem is simpler, for in many cases the question at issue is not the right to compensation but what amount of compensation is due.

One difficulty arises from the question whether in evaluating incapacity account should be taken of the unemployment situation. Theoretically that situation is irrelevant both in workmen's compensation and invalidity insurance. The purpose of both is to compensate for loss of earning power caused by disease or accident, and if the unemployment situation were admitted as a factor in evaluation both would take

[1] The Evaluation of Permanent Incapacity for Work in Social Insurance. International Labour Office. London: P. S. King and Son. 1937. Pp. 375. 10*s*. 6*d*.

on the function of unemployment insurance. In a case decided in June, 1932, the German supreme social insurance court held that—

"In evaluating incapacity no account should be taken of actual prospects of employment, even during a long period of depression, since otherwise charges would be placed on invalidity insurance which it is unable to bear. . . . Moreover, if the economic situation were to improve, the pensions already awarded would have to be withdrawn."

In practice, however, the unemployment situation is, in varying degree, taken into account. When unemployment is so prevalent that even able-bodied workers are unable to find work a partially disabled worker has no chance in the labour market, and whatever the theoretical position may be this is a consideration which in practice does operate in evaluating incapacity.

THE DOCTOR'S FUNCTION

Among the numerous interesting problems discussed in the monograph, of which only a few can be indicated here, is that of the doctor's function in evaluating incapacity. Everywhere it is recognised that the authority deciding the question of incapacity must be furnished with medical information, and it is generally held that the doctor's function is limited to providing the authority with an expert opinion on the medical questions involved. But it is sometimes contended that the authority should include a medical member, or even that it should be entirely medical. Weighty reasons are given against this extension of the doctor's function, but it is noteworthy that in the French invalidity insurance scheme the local committee dealing with appeals against the decisions of the insurance society is composed wholly of doctors.

Medical Benefit

Tribute is paid in the recent report of the Ministry of Health to the part taken by the medical profession in the working of medical benefit under the Insurance Acts, apart from actual services rendered by practitioners to their insured patients. The report says:

"In the actual administration of the service the medical profession plays an important part. It is represented on the insurance committee for each county and county borough, which includes also representatives of insured persons, local authorities and pharmacists. It has equal representation with insured persons on the subcommittees investigating complaints against doctors. Through the panel committees (which represent the insurance doctors of each area) it assists in determining questions of alleged extravagance in prescribing medicines and through the local medical committees (which represent the medical profession as a whole in the area, but are in many places identical with panel committees) it expresses an opinion on questions whether a particular form of treatment is within the doctor's contract. Its representatives are also associated with those of the Minister in the hearing of appeals against the findings of insurance committees in disciplinary cases, in advising the Minister before he decides to withhold money from a doctor for failure to attend or treat a patient as required by his terms of service and in determining the amounts to be allocated to each area out of the funds available for the remuneration of the doctors."

Having been in operation for almost a quarter of a century, the report continues, the insurance medical service is conducted on well-established lines and there is little change which can be attributed to a particular year. Such changes as occur in the content of the service are brought about gradually and automatically with developments in general medical practice amongst the community as a whole, and with the progress of medical education, since the insurance doctors are required to give treatment of the same standard as they would give to their private patients. Over a period of years there has been a tendency for the number of insurance doctors to increase rather more rapidly than the insured persons, so that on the average there has been a slight reduction in the number of patients for whom each doctor is responsible. During the year under review—namely, April, 1936, to March, 1937—however, there has been an abnormal increase of about 409,000 in the number of insured persons entitled to medical benefit, partly owing to the operation of the Act of 1935, which restored to benefit a number of persons who had lost their title owing to long unemployment, and partly to the increased volume of employment resulting from the turning economic prosperity. When the Government's intention to include juvenile employed persons in the scheme of medical benefit is implemented by the necessary legislation about one million at the outset will be added to the number of beneficiaries in Great Britain.

THE LANCET 100 YEARS AGO

September 2nd, 1837, *p.* 843.

From a leading article.

The senate of the new metropolitan university—the University of London—is now, in all probability, employed in preparing the curriculum of studies to be pursued by such students as may desire to present themselves for examination before the members of that institution. . . . This curriculum ought to form the commencement of a new era in the history of education in this country. We have suffered severely under the monstrous abuses which have prevailed in our old and aristocratic institutions, and we earnestly hope that the new university, the offspring of Reform, true to the principles which gave it birth, will, at once, adopt a large and liberal plan of medical education, rejecting the sordid and absurd restrictions which abound in the system so pertinaciously adhered to by its predecessors.

Without intending, on the present occasion, to pass in review the entire system of medical education, . . . we shall enter on the most prominent points of consideration in discussing this subject, namely, the complete abolition of the certificate system; the expediency of conducting all examinations for medical degrees in public, and the necessity of making all such examinations strictly practical in their nature. . . . The certificate system is a fraud . . . rendered a double fraud by its inventors and supporters. Were we to ask one of these men "what is a certificate, or why is it enjoined?" his answer would be, that "a certificate is a piece of paper which proves the diligent attendance of the pupil on the lectures of his teacher, and, moreover, insures the competency of the teacher, because none but men of eminence are authorised to grant it" . . . There is not a pupil in London who is ignorant of their real value, who does not know that they may be obtained without the *ennui* of attending the prosy discourses of the "recognised" lecturers; aye, or without ever having set eyes upon the ticket-mongers faces. . . . Let the pupils elect freely their own teachers. The want is theirs. Their sense is acutest for discovering the means of satisfying the hunger after knowledge. No bad teacher ever sat long in the chair of a professor as the *freely-elected* representative of science. Abolish certificates, says the medical reformer, but, at the same time, make the examination a searching inquisition, a thorough and practical enquiry . . . the candidate should be led to the bedside of the patient, and there made to undergo a strict examination into his proficiency in medical and surgical knowledge. . . . The examination having been made a thoroughly practical one, the next step must be that of ensuring its publicity. . . . Publicity would inevitably preserve them from the insolent browbeating, and the brutal and dastardly insolence to which they are now successfully subjected.

SPECIAL ARTICLES

THE PHOSPHATASE TEST FOR EFFICIENT PASTEURISATION

BY W. A. HOY

AND

F. K. NEAVE, B.S.A.

(*From the National Institute for Research in Dairying, University of Reading*)

IN 1935 Kay and Neave [1] published in this journal an account of the application of what was then a new method—the phosphatase test of Kay and Graham—for assessing, by examining the processed milk itself, the efficiency of pasteurisation. It will be recollected that one of the most significant features of the test is that over all ranges of temperatures and times, *Mycobacterium tuberculosis* is destroyed rather more quickly than the phosphatase, so that a heated milk which does not contain the enzyme, no matter what the particular conditions of heating, may be regarded as having been sufficiently heated to destroy any *M. tuberculosis* originally present and hence all the common pathogenic organisms also. By using the delicate "test B" on designated pasteurised milk as sold to the public and to school-children, Kay and Neave found that many pasteurisation plants both in London and elsewhere were, in 1935, turning out a product which was improperly processed.

During the two years which have elapsed since the publication of these findings, firms engaged in pasteurisation have had opportunities of taking advantage of improvements in plant design, of improving their own operation technique, and of improved methods of laboratory control. It is of interest, therefore, to compare the results obtained in a recent "stock-taking" survey using the same test as before, and covering areas similar, though not quite identical, with those covered in 1935. Though neither is on a large scale, the surveys are, we believe, sufficiently representative to enable some general conclusions to be drawn as to trends in pasteurisation efficiency over the past two years.

In the present, as in the former survey the samples have come from London boroughs, from provincial towns, and some from rural districts. They have all been sold, or have been intended for sale as designated pasteurised milks. Either they were bought by one of us over the counter or otherwise direct from the distributor or taken, by arrangement with the local authority, from consignments being sent for sale in schools, or collected by local authorities. So far as we are aware there has been no selection of better or poorer distributors.

RESULTS

The figures shown in the Tables I to V as "blue units" have the following significance:

Below 2·3 *units.*—Milk has been heated to such a temperature and for such a length of time that pathogenic organisms are destroyed; the processing is satisfactory.

Between 2·3 *and* 6 *units.*—Some small error in pasteurisation technique; a tightening-up of the operating technique and/or a careful examination of the functional efficiency of the plant is required.

Above 6 *units.*—Some serious error in the pasteurisation technique.

Above 10 *units.*—Some gross error in pasteurisation technique; either the plant or the management is very seriously at fault.

The figures both in Table VI and VII are based on too few determinations to be reliably expressed on a strictly quantitative scale. What one can say is that improvement throughout the two years has been definite, particularly in the larger firms where, in many instances, well-trained technical men are now in charge of the plant, and the laboratory control is competent.

Application of the Phosphatase Test

TO LOW-TEMPERATURE PASTEURISATION

Like many other milk tests the phosphatase test may be used for two different purposes:

(*a*) *Advisory*, to determine whether a plant in which time and temperature of exposure appear to be correct is really functioning well, and if not, to assist in tracking down the cause of the fault.

(*b*) As a help in *enforcing the law*, to make sure that licensees are carrying out their duties according to the Milk Special Designations Order, 1936.

From the advisory standpoint, the test is most useful when the testing is carried out by or for an experienced person who is in close touch with the plant and has available all the other relevant data (temperature charts, bacteriological findings, diagram of details or plan layout, &c.). From the standpoint of ensuring that licensees are not infringing the law, if a properly conducted phosphatase on the pasteurised milk gives a "positive" (i.e., more than 2·3 blue units) this provides in our experience convincing evidence [2] apart from any other information that may be available regarding the plant, that heating has been insufficient and that the legal requirements have been infringed to an extent proportional in seriousness to the number of blue units found. The following examples, from among those that have been investigated by us during the last three years, are of cases where a distinctly positive, though not very high phosphatase test has shown that the pasteurisation plant has not been functioning well, though time and temperature appeared to be correct.

Example 1.—Samples of bottled pasteurised milk as supplied to school-children from a certain dairy gave a positive result on several occasions. On investigation it was found that the bottling plant was first being used for Grade A T.T. milk. Owing to the high quality of the raw milk and the fact that the machine was to be used at once the bottling plant was only rinsed, apparently rather perfunctorily with clean water direct from a hose. Negative results were obtained only when the interior surfaces of the whole of the plant were washed quite free from traces of raw milk.

Example 2.—This milk was also supplied in bottles to school-children. After the positive result had been obtained a visit was paid to the dairy with a representative of the firm who supplied the pasteuriser. An accurate thermograph was in use and there was no doubt that the time and temperature of heating were both correct. The outlet valve of the pasteuriser was found, however, to be very loose in its fitting. It was then proved that milk was escaping from the holder via this fitting into the outlet

[1] Kay, H. D., and Neave, F. K. (1935) *Lancet*, **1**, 1516.

[2] An occasional anomaly—i.e., a figure of slightly above 2·3 units in a properly pasteurised milk is not absolutely impossible in milks in which certain unusual organisms have developed freely before the milk has been pasteurised. Such an anomaly only occurs in milks which have been in an advanced state of deterioration before pasteurisation, with bacterial counts of the order of tens of millions, i.e., milk which no responsible distributor would sell for liquid consumption, raw or pasteurised.

TABLE I

(*a*) SOLD TO PUBLIC AS "PASTEURISED MILK"
London Boroughs

Ref. No.	Month in 1937.	Size of plant and firm indicated by a letter.		Numerical result of test (blue units).	Findings.
594	Feb.	Small	A	4·1	Incorrectly pasteurised.
597	„	„	A	4·6	
623	Mar.	„	A	8·5	Grossly underheated.
599	Feb.	„	B	3·6	Incorrectly pasteurised.*
737	June	„	C	14·0	Grossly underheated.
596	Feb.	Interm.	D	1·1	Pasteurised.*
625	Mar.	„	D	2·5	Incorrectly pasteurised.*
627	„	„	D	30 +	Raw or grossly underheated.*
587	Feb.	Large	E	1·1	Pasteurised.
617	Mar.	„	E	0·9	
593	Feb.	„	E	1·1	
622	Mar.	„	E	1·0	
589	Feb.	„	F	1·2	
618	Mar.	„	F	1·1	
595	Feb.	„	F	1·3	
624	Mar.	„	F	1·1	
591	Feb.	„	G	1·1	
620	Mar.	„	G	0·9	
644	„	„	G	1·0	
641	„	„	H	1·1	
592	Feb.	„	I	1·4	
621	Mar.	„	I	1·0	

* Old plant. New plant now being installed in both cases.
All the above samples were bought in the ordinary way from shop, cart, or barrow, and were all being exposed for sale as (designated) pasteurised milk.

TABLE II

(*b*) SOLD TO PUBLIC AS "PASTEURISED MILK"
Towns (population above 20,000) or cities other than London

556	Jan.	Small	J	1·0	Pasteurised.
608	Mar.	„	J	1·1	
560	Feb.	Interm.	K	1·5	
576	„	„	K	1·3	
609	Mar.	„	K	30 +	Grossly underheated.*
650	„	„	K	1·8	Pasteurised.‡
549	Jan.	Large	L	1·6	Pasteurised.
559	Feb.		L	Below 2·3	
551	Jan.	+		4·3	Incorrectly pasteurised.
557	Feb.	+		1·1	Pasteurised.
579	„	+		1·3	
580	„	+		1·1	
611	Mar.	+		1·0	
612	„	+		4·8	Incorrectly pasteurised.
636	„	+		1·8	Pasteurised.
637	„	+		18·0	Grossly underheated.
659	„	+		4·3	Incorrectly pasteurised.
686	April	Large	M	1·0	Pasteurised.

+ = Samples obtained under circumstances which prevent certainty of the sizes of the plants used. Almost certainly a large plant in each case.
* It was ascertained that milk left holder at 120° F.
‡ Defective working (sample 609) now repaired.

TABLE III

(*c*) SOLD TO PUBLIC AS "PASTEURISED MILK"
Rural Areas

Ref. No.	Month in 1937.	Size of plant and firm indicated by a letter.		Numerical result of test (blue units).	Findings.
542	Jan.	Small	U	5·4	Incorrectly pasteurised.
569	Feb.	„	U	2·0	Pasteurised.
570	„	„	U	2·0	
578	„	„	U	1·1	
656	„	„	U	1·4	
660	Mar.	Interm.	Z	2·0	
537	Jan.	Large	AA	2·1	
539	„	„	AA	1·8	

pipe and pump leading to the cooler. As the pipe line was closed and the operator was inexperienced the leak went unnoticed until a positive result with this test indicated a fault which might have had a dangerous sequel.

Example 3.—An advisory visit was paid to a dairy where a pasteuriser was in operation. The vat itself was heavily insulated, but between the holder and the outlet valve there was a dead end consisting of several inches of bare pipe. After the milk had been held at 146° for 30 minutes the first milk from the valve when subjected to the phosphatase test gave a positive result.

Example 4.—Bottled pasteurised milk from this plant gave irregular phosphatase results showing occasionally considerable errors of pasteurisation. Previous observations with the same type of plant had shown that on occasions the first milk from the holders ran out at a lower temperature than the remainder. At first this was thought to be entirely due to lack of agitation during holding, but sometimes when the average temperature should have been 145° F. temperatures below 140° F. were recorded. It was then realised that large fluctuations in the rate of heating of the preheated milk occurred, due in part to a faulty steam control valve, and in part to the too numerous duties imposed on the plant operator. As a consequence the first portion of milk flowing into the empty vat was not infrequently underheated. In cases where the underheated milk was followed by milk at higher temperatures (in sufficient quantities, indeed to have raised the average temperature of the whole well above the pasteurisation minimum) the colder denser milk, in absence of agitation, remained at the bottom of the vat without appreciable admixture with the hotter milk above it. Hence samples of the first milk out of the holder sometimes gave a positive phosphatase test, whilst later samples *from the same vat* were negative. The test now permits a more careful control to be kept over errors of this type.

The causes of the positive phosphatase in examples 1 to 4 respectively were thus: (1) The use of the same bottling plant for raw and pasteurised milk. (2) Leakage of unheated milk from an in-vat pasteuriser. (3) Uninsulated dead-end between vat and emptying valve. (Flush valves are now being fitted with this make of plant.) (4) Fluctuating temperature of the milk from the preheater combined with absence of agitation in an insulated holder.

TO HIGH-TEMPERATURE SHORT-TIME PASTEURISATION

The phosphatase test is also of value in controlling the efficiency of the high-temperature short-time process of pasteurisation. Thus in two series of carefully controlled experiments using two different types of apparatus (the Stassano and the A.P.V. type), in no case in which the recommended temperature

TABLE IV

(*d*) SOLD TO SCHOOL-CHILDREN AS "PASTEURISED MILK"

London Boroughs

Ref. No.	Month in 1937.	Size of plant and firm indicated by a letter.	Numerical result of test (blue units).	Findings.
681	April	Small S	1·4	Pasteurised.
698	May	„ S	2·0	
664	April	Large N	1·3	
665	„	„ N	1·6	
673	„	„ N	1·8	
666	„	„ O	1·0	
704	May	„ O	1·5	
667	April	„ P	1·0	
668	„	„ P	4·1	Incorrectly pasteurised.
670	„	„ P	5·6	
676	„	„ P	3·3	
674	„	„ E	1·0	Pasteurised.
683	„	„ E	1·0	
709	May	„ E	1·3	
677	April	„ Q	1·1	
680	„	„ Q	1·0	
699	May	„ Q	1·3	
711	„	„ Q	1·4	
695	„	„ R	1·3	
705	„	„ R	2·1	
710	„	„ R	1·4	

In a larger series 5 samples out of 51 were incorrectly pasteurised—i.e., some 10 per cent.

TABLE V

(*e*) SOLD TO SCHOOL-CHILDREN AS "PASTEURISED MILK"

Areas other than London

555	Jan.	Small T	1·1	Pasteurised.
565	Feb.	„ T	1·6	
543	Jan.	„ U	15+	Grossly underheated.
545	„	„ V	1·1	Pasteurised.
546	„	Interm. W	1·5	
564	„	„ W	3·3	Incorrectly pasteurised.
630	Mar.	„ W	1·1	Pasteurised.
547	Jan.	„ K	5·5	Incorrectly pasteurised.
563	Feb.	„ K	2·3	
605	„	„ K	1·5	Pasteurised.
632	Mar.	„ K	1·2	
568	Feb.	Large X	1·9	
583	„	„ X	1·3	
634	Mar.	„ X	1·1	
574	Feb.	„ Y	1·8	
607	Mar.	„ Y	1·2	
613	„	„ Y	30+	Grossly underheated.
575	Feb.	„ F	1·4	Pasteurised.
614	Mar.	„ Q	1·1	

In a larger series 6 samples out of 31 were incorrectly pasteurised—i.e., some 20 per cent.

TABLE VI

COMPARISON OF SUMMARISED RESULTS IN 1935 AND 1937

Where pasteurised milk sold.	Percentage of samples failing to pass the phosphatase test ("B").					
	1935 survey.			1937 survey.		
	Se.	Mi.	Total.	Se.	Mi.	Total.
To public in London boroughs*	32	12	44	9	23	32
To public in towns above 20,000 inhabitants (other than London)	17	17	34	11	6	17
To school-children in London boroughs	33	13	46	0	14	14
To school-children in areas other than London ..	33	25	58	11	11	22
Total percentage (not average)	*29*	18	47	*8*	14	22

Se. and Mi. = Serious and minor errors.

* The percentage quantity of faulty milk in London appears greater than it really is, as a very large proportion of the whole is sold by the large firms who now process satisfactorily.

The proportion of serious errors from all sources has diminished from almost one-third to less than one-tenth of the samples examined.

TABLE VII

COMPARISON OF PASTEURISATION PERFORMANCE IN RELATIONSHIP TO SIZE OF PLANT, 1935 AND 1937

Number of serious errors in 100 samples

Small plants.		Medium-sized plants.		Large plants.	
1935	*1937*	*1935*	*1937*	*1935*	*1937*
36	17	32	13	32	4

and other conditions were used did the processed milk give a positive phosphatase test.

Table VIII gives some recent findings obtained under commercial conditions with two other types of high-temperature short-time heating plant, in which the temperatures used were lower than those recommended for any high-temperature short-time process and considerably lower than those used in

TABLE VIII

PLANT A.—*Small tubular heater hand controlled, considerable fluctuations in temperature.*

PLANT B.—*Danish type rotary heater; large volume of circulating water; temperature automatically controlled to ± 1° F.*

PLANT A		PLANT B	
Maximum milk temperature °F.	Phosphatase.*	Maximum milk temperature °F.	Phosphatase.*
152	30+	157	3·2
154	20	157–159	2·0
154	12·2	157–159	1·8
154·5	14·0	158	9·1
155	10	158	2·1
158	3·9	158	2·2
159	Less than 2·3	159	2·0
..	..	159–160	2·0
..	..	159–160	2·1
..	..	159–160	1·4

* Tests on milk after bottling.

the Stassano or the A.P.V. plants. In the operations summarised in Table VIII, the heating process was employed primarily to enhance keeping quality.

In both these plants, for consistently "negative" phosphatase results (below 2·3 blue units), a constant temperature of 160° or above is desirable. The period during which the milk is exposed to this temperature is, in both cases, probably of the order of 20 seconds; no exact statement is at present possible as to the precise period during which any given sample of milk has been heated in either of these types of apparatus.

The data in Table VIII, together with the Stassano and A.P.V. data just quoted, afford further evidence of the applicability of the phosphatase test as a control of the efficiency of the "flash" method.

Summary

(1) A survey, using the phosphatase test, of the efficiency of pasteurisation of designated pasteurised milks in London and elsewhere has shown a considerable improvement during the last two years.

(2) This improvement is particularly marked in the milk processed by the larger distributing firms having their own control laboratories, though it is also to be observed to a lesser degree in that of firms of intermediate or of small size.

(3) In the two latter classes, however, the efficiency is still far from satisfactory.[3]

(4) The phosphatase test has proved useful in advisory work in assisting dairies to track down faults in the functioning of their pasteurisation plants. (Examples are given.)

(5) The test seems equally applicable to the control of the efficiency of high-temperature short-time pasteurisation plants.

We are indebted to Prof. H. D. Kay for his encouragement and advice throughout the course of this work, and to various medical officers of health and sanitary authorities for their kind collaboration in obtaining samples of milk.

UNITED STATES OF AMERICA

(FROM AN OCCASIONAL CORRESPONDENT)

HEALTH BY RADIO

On August 18th I had the privilege of attending the fourth anniversary of the Health Hunters radio programme of the New York State Department of Health over the powerful station W.G.Y. The play presented was written, acted, and produced entirely by members of the department's regular staff. It is hard to believe that any professional group of actors could have given a more convincing performance. The drama concerned a farm woman who had stepped on a nail when tending her turkeys during the night and was treating the wound with stoical Yankee indifference. The tact and generosity of the young rural practitioner emerged in the play as well as the seriousness of the danger of tetanus in punctured wounds. This last moral was driven home by a simple but effective lecture occupying four minutes at the close of the play. The original programme from this station, which has been open for some 15 years, took the form of short lectures; in 1933 the talks were dramatised in a series of plays of which nearly 200 have now been performed, and have apparently created widespread interest. The plays are recorded on gramophone discs which are sold at cost price to any organisation interested in health education.

PURSUIT OF TUBERCULOSIS

The mortality-rate from tuberculosis in 1933 was less than a third of what it was in 1900 in that part of the country for which statistics are available. Still, however, tuberculosis remains the first cause of death between the years 20 and 35. Several leaders in the public health field have recently urged the need for further measures to combat it. Among them Prof. W. H. Frost of the Johns Hopkins School of Hygiene recently gave a heartening address to tuberculosis workers in New York. He is not willing to give them credit for all the success so far achieved but he presents convincing arguments that their efforts have been fruitful. The measures that have been taken to limit the spread of the tubercle bacillus may have been insufficient to prevent eventual infection of nearly everybody, but they may still be of great effect in mitigating the severity of resulting infections, because of reduced frequency and dosage. Unlike other contagious diseases tuberculosis depends for its spread upon the degree of severity of the disease. If, in successive periods of time, the number of infectious hosts is continuously reduced, the end-result of this diminishing ratio, if continued long enough, is likely to be extermination of the tubercle bacillus.

As the number of open cases diminish vigilance in their control must be increased. At the forefront of his programme Dr. Frost puts a provision for isolation of all open cases in sanatoria for the full period of their infectivity. With this he combines social support of the families of the tuberculous, adequate not only to maintain but when necessary to raise their standard of living, for poverty reinforces the risks of intimate contact. No mention is made of the tuberculosis colony which has singularly failed to impress the imagination of tuberculosis workers in this country. The discovery and energetic treatment of the early non-infectious cases are not overlooked, although less emphasised by Dr. Frost. On the other hand, they are the keystone of the programme in Detroit where the most ambitious attack on tuberculosis yet staged in this country is now under way. Detroit's health commissioner, Henry Vaughan, who is a doctor of public health but not of medicine, has been conspicuous among health administrators for (1) his ability to secure the coöperasion of the practising medical profession and (2) his success in convincing the fiscal authorities of the economic benefits of public health work. In December, 1936, the city council authorised the department of health to add $200,000 per annum to its annual budget to be used exclusively for case-finding work. Of this, $40,000 is allotted to tuberculin testing and an equal sum for X ray examinations. It is expected that a million dollars will be spent in this way during the next five years. The family physician exercises his judgment as to whether these tests should be paid for by the suspect or by the city, and in the latter case the city assumes responsibility. Each person who has a negative tuberculin test costs the city one dollar; those with positive tuberculin tests who require subsequent radiological examinations and sometimes consultation may cost the city as much as $5 each. Between Feb. 1st and May 21st of this year (the figures were prepared for the Atlantic City meeting of the A.M.A.) 33,367 tuberculin tests had been given, of which 22 per cent. were positive;

[3] This is not meant to imply that the smaller *plants* are necessarily less satisfactory than the larger ones. We have been in touch with one small batch pasteuriser (with an efficient operator) over a period of several months, and no failures have been encountered.

5122 persons had had radiological examinations and 242 new active cases of tuberculosis had been discovered. Three groups in the population are given precedence in searching for these early cases: those in the practice of the physician whom he suspects of being tuberculous, household contacts of known active cases, and persons residing in districts of excessive tuberculosis mortality. Agreements have been signed by 800 Detroit physicians to coöperate with the department of health in this campaign.

MEDICINE AND THE LAW

Legal Interest in Blood-group Tests

THE *Law Society's Gazette*, published for members of the Society only, contains in its August number a note on blood-group tests in affiliation proceedings. Solicitors are well aware of the notorious uncertainty of the oral evidence in bastardy cases; they would welcome any scientific method of arriving at the truth. For this reason the Law Society, it seems, has approached the Home Office as to the possibility of making better use of the system of blood-group tests. The Home Office is reported to have replied in general terms that it is desirable that the system should be better known. The note wisely inculcates a proper caution in estimating the possibilities of these tests. It refers to the researches of Landsteiner in America amongst others and states that they are said to have established that the blood of a human being will be found to belong to one of certain types and that the characters of none of these types can appear in the blood of a child unless it be present in the blood of one or both of the parents. Due emphasis is laid on the fact that the present value of the tests is to establish a negative. They can prove that A is not the father of B's child. The note suggests that non-paternity is established in about one case out of three. It is said that the tests are widely used in Europe and that their use is growing in the United States.

In the English courts reference to the blood-group tests is at present mainly a matter of tactics. Offers to submit to the tests are paraded as indications of good faith and veracity; the side which refuses tends to be discredited. No doubt, however, the advocate's knowledge of the possibilities is growing. Apart from the use of blood-group tests in affiliation proceedings, a barrister or solicitor who practises in criminal cases may have to deal with the question whether blood stains on the clothing of an accused person are human or non-human, and, if human, whether they are the man's own blood or no. Among legal text-books which discuss these points the new edition of Wills on "Circumstantial Evidence," just published, may be mentioned. It contains a note by Sir William Willcox on the precipitin test and an appendix by Dr. James Davidson, director of the Metropolitan Police Laboratory, on blood grouping. The legal reader can thus learn that it is now possible to ascertain whether blood is human or not and to distinguish the group to which the human blood belongs, though it is not yet possible to say from which particular person the blood came.

Child's Death after Throat Operation

A recent inquest in Middlesex was held upon a child eight years old who had died in hospital during or after an operation on her throat and nose. The operating surgeon described the child's condition. There was chronic infection of both cavities in the upper jaw. An operation had previously been performed for the removal of the tonsils and adenoids. He operated on the nose to drain the antrum and made an opening for this purpose. After the anæsthetic had been given he inserted two pledgets soaked in a cocaine solution. The coroner put to the witness that the pathologist's report attributed death to shock and to the inhalation of fragments of the adenoids during the operation. How, he asked, did these fragments get into the lung? One fragment was found in the lung and one in the windpipe, though neither was large enough to cause an obstruction which would prevent a reflex cough. The surgeon said he did not think the pledgets, which had been squeezed out, contained so much cocaine as to stop a cough. Dr. Alfred Piney, the pathologist who conducted the post-mortem examination, described how he found small pieces of adenoid tissue in two places. In his opinion the child did not die from suffocation but from shock due to inhaling these fragments. In answer to the coroner he said that he had himself known instances where blood and tissue had been found in the bronchi after similar throat operations. The cause of death was undoubtedly shock, a not uncommon cause of death in all operations. The irritation in the windpipe caused the heart to stop; once it had stopped, it was very difficult to restart it. The witness estimated that about one person in 10,000 would die from this operation; if the child had coughed, she would not have died. The operation, as performed, was the only accepted method. Though there was risk in all these operations, the risk was minute. Asked by a juror whether the result indicated any lack of skill on the part of the operator, Dr. Piney answered in the negative. The fragments, he said, did frequently get away but generally ran out of the mouth with the blood; the question of skill scarcely arose as there was no known procedure for preventing what had apparently happened in this case. The jury returned a verdict of death by misadventure.

Insanity and Workmen's Compensation

In a recent case at Walsall it appeared that a miner met with an accident in the pit and sustained a cut on his finger. Sepsis followed and an award was made on the basis of total incapacity. Afterwards he came back to work, but his mind became affected and it was necessary to remove him to a mental hospital. It was claimed on his behalf that the insanity was part of the accident; no accident, no insanity. The employers, on the other hand, contended that the cause of the insanity was more remote. The man's mind, they said, had become unbalanced through his brooding over the accident; his present condition was not so directly due to the accident as to entitle him to recover under the Workmen's Compensation Act. The county court judge came to the conclusion that there was an element of mental shock in the original accident and that there was a sufficiently close connexion between that shock and the present mental illness. He awarded the miner 19*s.* 2*d.* per week. Mention was made of a possible appeal.

ROYAL NORTHERN HOSPITAL, LONDON.—An anonymous donor has offered this hospital £40,000 provided that a similar amount is contributed by others. This gift is in connexion with the special appeal for £350,000 which is being made for the reopening of wards, and for the renovation and rebuilding of certain parts of the hospital.

GRAINS AND SCRUPLES

Under this heading appear week by week the unfettered thoughts of doctors in various occupations. Each contributor is responsible for the section for a month; his name can be seen later in the half-yearly index.

BY A LONDON PHYSICIAN

I

THE English countryside is green and gold, changing in the distance to misty blue. To comply with the qualification of the title of this article, thought seeks a necessary freedom. Thought may not escape from the nerve-cells to which it is inscrutably linked, save to take up its dynamic existence in other nerve-cells or to lie latent in print. Yet by carrying its nutritive groundwork of body to the countryside, thought hopes to free itself from the fetters of London—Cobbett's wen—and to recover from the exhaustion of a year of out-patients. The fetters then will be loosened, leaving merely the tight bonds of heredity, training, and the laws of libel.

Swinburne has assured us that man may have freedom but not peace. Even if we believe only in the second part of the poet's statement, the reassurance, although expressed in the subjunctive mood, of the first part cheers us, educated in determinism as we are. In the same way are we heartened by the popular books of famous astronomers who tell us that their heaven-gathered data, purified by abstruse mathematical treatment, suggest the inadequacy of determinism. Determinism affronts the ego, and we are glad of the least loophole of escape, even if only into the illusion of planning and free will.

I confess that I am more than a little afraid of print. It records both grammatical errors and wrong views. There is something inexorable about it, attractive to the high enthusiasm of youth, but frightening to the caution of experience. The preposterous juvenilia of famous poets are a magnified example to the young physician. Eager in his youth to affix his fancies with black print to a shining page, he later wishes he had never been so foolish.

* * *

Regarded from without, the London physician's career receives the stamp of authority when he passes the examination for the M.R.C.P. He returns to a well-known establishment near Covent Garden the armour, shaped like a morning coat, if indeed he thought such armour necessary—and lo! the future spreads before him like a rosy dream. Many years will pass till he feels with Swinburne:

> "I am weary of days and hours, . . .
> Desires and dreams and powers . . ."

Before he can attain an honorary post he must pass through the stage of Medical Registrar. This hard-worked individual has a dual existence. One half of it is that of a dignified dog's body, the other an exciting contact with intricate clinical cases and recalcitrant students. He has responsibilities—although his surgical colleagues would say that his only important one is to know when to call them in.

Assuming that the Registrar is promoted to the rank of Assistant Honorary Physician, his dignity increases. But it is now that his troubles really begin. In many cases they are financial, but in all there will be the difficulties of etiquette and the management of senior practitioners who may call him in. Annoyingly, too, their diagnoses are often as good as his. The older he grows the more he realises that a diagnosis is often a will-o'-the-wisp which in certain cases leads even that final and autocratic judge, the morbid anatomist, into the marshes of speculation.

* * *

Apart from these personal difficulties, vague shadows of wider events will disturb his leisure hours. Is the whole system of medical practice going to change? And will it change in his own lifetime? The number of civil servants has increased by about 100,000 since pre-war days. Are the doctors to swell this increase? The bureaucratically-minded are naturally enthusiastic for the change, but some of the others are still somewhat sceptical of its value. This is not the place to discuss the public and private advantages and disadvantages of a State medical service. The economic situation of the young physician would certainly be eased by such a service. There is a growing opinion that "charitable" work should be paid for: not remotely by fortune and fame in old age, but at once by salary. I was delighted to hear, at a recent debate on State *v.* Private Practice, a serious-minded student put forward the claim of the medical student for payment for his services. The State would be able and, he thought, willing to pay him. At present the State does indirectly contribute to medical education, but no payment is so sweet as a direct one. Direct pay means more direct insistence on labour. Slacking would be possible only in the higher branches.

* * *

Should a State Medical Service supervene, the physician would like an assurance that promotion would not necessarily mean removal from the clinical sphere to that of administration. "The proper study of mankind is man" and Pope, were he alive to-day, would add "not a redundancy of forms." There is something to be said for the compulsory writing of medical notes in heroic couplets, to prevent prolixity.

* * *

At breakfast and in the evening I turn to the lighter newspapers for consolation. I rarely read beyond the front page. The jaded mind discovers there a document of lurid international events (including boxing) and of psychotic private behaviour, and turns to one of the more sedate journals to regain its balance. I think of my friends who have been injured in Spain or who are at this moment in danger of shell and flame in China. Truly at the heels of Mars do famine, sword, and fire crouch for employment. The havoc of war makes us glad of determinism to remove the responsibility. Many authors have claimed that war fulfils a useful biological function but these are mostly Malthusians. It has certainly provided us with experiments in trauma on a large scale. An increased knowledge of cerebral localisation, of the devastating effects of poison gases and of epidemics is a poor compensation for the damage done.

* * *

Experiments implemented unknowingly by the iron and gases of Mars recall peace-time research. I suppose that the aim of the average physician

is to become an able clinical diagnostician and practical therapeutist. By research is usually meant laboratory investigation. Does a period in the laboratory—of pathology, physiology, or biochemistry—improve or worsen ability in clinical medicine? My own opinion is that following a period of laboratory work there is a negative phase of lack of confidence in clinical work. This phase, however, is later compensated by a widened outlook and ultimately the result is, I think, a better grasp of clinical problems. Whether the research has any positive value depends on the research worker and in no small degree on his advisers. Even if the results are purely negative, provided the work has been honestly carried out they must be held to be of some value. For much of the labour of science is clearing the ground.

* * *

Research is, save to those with a strong aptitude, tedious and often disappointing. The clinician is apt to be impatient of laboratory technique. He is hampered by lack of knowledge of chemistry and of biological methods. To improve his outlook he may attend the meetings of one of the learned scientific societies. There he listens to highly specialised communications which only about one per cent. of the members of the society themselves fully understand. He hears polite and sometimes delicately offensive wrangles between the Achilles of one school of thought and a rival Hector. Occasionally Achilles sulks or Hector is slain but at subsequent meetings they arise again to renew the ghostly combat. In time he comes to know something of the epic struggle, and he learns that to attain heroic status in research requires years of application. He may become cynical about science but is more likely to admit its importance in medicine. Indeed he may even acquire a devotion to clinical science of which laboratory science is the complement. Surely Shaw's witticism that nothing is true for the physiologist unless it has involved the sacrifice of dogs is something of an exaggeration.

CORRESPONDENCE

TRANSFUSION OF SUPRAVITAL BLOOD

To the Editor of THE LANCET

SIR,—In your leading article (p. 453) on the remarkable work of Shamov and Yudin you say "It is amazing that post-mortem liquefaction should for so long have failed to attract attention." The phenomenon has, however, not failed to be noticed though it may not have been described. Every forensic pathologist, whose work is mainly among violent and sudden deaths, is familiar with the fact that the blood in many of his cases remains fluid after death, in striking contrast to hospital and private cases in which agonal clotting has had an opportunity to occur. He has also noticed that samples of blood removed for examination in these cases separate fairly quickly into plasma and cells without the addition of any anticoagulant. I for one have not observed that in these cases the blood first coagulates and then liquefies—it has been liquid in the veins at all stages; my latest case is a male of 30 examined one hour after death. If however hæmorrhage occurs into a serous cavity (such as the pericardium in ruptured heart) one large single clot forms and is seen at whatever stage (before decomposition) the examination is made. What those of us who have had special opportunities for noticing this phenomenon have *not* thought of is the use to which it could be put; and it required the genius of the Moscow workers to discover this.

I think you make an important point, Sir, when you say that the relatives of the dead man should be only too glad to think that his blood has been able to save another life; and as for the transfusee he could be assured that the blood given is in fact alive.—I am, Sir, yours faithfully,

Kings Bench-walk, August 23rd. TEMPLE GREY.

SHOULD THE ECZEMATOUS WASH?

To the Editor of THE LANCET

SIR,—As a rule I find that lotions and ointments do not give the best results in cases of the kind described in the annotation in your issue of August 21st. I had a case sent from Scotland some time ago, a girl of 8 years, who for some weeks had been suffering from weeping eczema in both hands. The fingers were bandaged separately over lint and ointment. The mother had carried out this treatment night and morning for some weeks without success, so I tried a different method. I removed all the dressings and covered the whole hands copiously with compound chalk powder, and then enclosed them in muslin gauze bags firmly secured at the wrists and large enough to enable the fingers to be moved freely and to admit of free ventilation. The dressing was continued twice a day for three weeks when the condition gradually subsided until no trace was left. Perhaps others may he inclined to try this dry treatment in those obstinate cases.

I am, Sir, yours faithfully,

JAMES G. MACASKIE.

Sea Houses, Northumberland, August 21st.

RAPID DETECTION OF B. TUBERCULOSIS IN MILK

To the Editor of THE LANCET

SIR,—Dr. Mary Maitland's report in your issue of May 29th is of great interest. The taking of samples from each quarter of a suspected cow's udder is an improvement. If the following procedure be adopted the organism should be detected with still greater ease and certainty. The cow should be thoroughly milked out, the udder massaged, especially any part showing induration, and the small amount of liquid which can then be drawn from each quarter delivered direct into four sterile bottles. Any process which increases the certainty of detecting T.B. and decreases the time between drawing the sample and issuing the report is worthy of attention, and it is with this object in view that the writer suggests that others give this method a trial.—I am, Sir, yours faithfully,

S. ALLINSON WOODHEAD.

The Laboratory, Lewes, Sussex, August 28th.

"NO PLACE FOR AN EPILEPTIC BOY"

To the Editor of THE LANCET

SIR,—Dr. Lloyd and Dr. Jacobson raise the old and difficult question of the certification of moral defectives under the Mental Deficiency Acts. Let us assume, as we may well do, that this boy showed no defect in intelligence by ordinary intelligence tests. Had he not been an epileptic he would, without question, have passed into one of the Home Office approved schools. Because of his epilepsy that way is barred. Has he therefore to be labelled as a moral defective rather than an ordinary

delinquent? There must be many children in approved schools who are equally deserving of a similar label, and we should soon arrive at the definition of a moral defective as a delinquent for whom, for some reason or other, no place could be found by the courts.

I speak under correction but I have the impression that, in practice, few cases are now certified as moral defectives, unless there is clear evidence of defective intelligence associated with the anti-social conduct.

I am, Sir, yours faithfully,

Lingfield, Surrey, August 25th. J. TYLOR FOX.

ŒSTRIN IN TREATMENT OF CUSHING'S SYNDROME

To the Editor of THE LANCET

SIR,—The letter of Dr. Charles W. Dunn in your issue of August 7th is of great interest, and it is satisfactory to learn that he also obtained relief of the severe headaches occurring in this condition by means of injections of Progynon B (Schering). He makes several observations, however, which call for remark:—

1. Despite intensive therapy I was unable to obtain reduction of the raised blood pressure.

2. On theoretical grounds Dr. Dunn recommends increased dosage of progynon during the premenstrual period, but, since these patients have either amenorrhœa or quite irregularly spaced periods, it would seem difficult to carry out this recommendation in practice.

3. It is impossible to agree that Case 1 in my series belongs to the adrenogenital syndrome, since laparotomy was specially performed and no abnormality of adrenals or ovaries was present.

4. The cost of œstrin therapy must be borne in mind, especially if treatment is to be continued over a period of from one to four years as advocated by Dr. Dunn. Progynon B oleosum forte (Schering) costs approximately £5 per 1,000,000 units. Had it not been for the generosity of Messrs. Schering, my clinical trial, continued over a period of some seven weeks, would therefore have cost approximately £135, or, at hospital rates, about £100.

It is to be hoped that synthesis of these substances will one day render possible a reduction in the cost.

I am, Sir, yours faithfully,

A. MORTON GILL.

The Middlesex Hospital, W., August 20th.

THE SERVICES

ROYAL NAVAL MEDICAL SERVICE

Surg. Comdrs. M. Brown to *Vindictive* (on commg.); and A. W. McRorie to *President* for course.

Surg. Lt. (D) H. C. Brewerton to *Pembroke* for R.N.B.

ROYAL NAVAL VOLUNTEER RESERVE

Surg. Lts. N. A. Vernon to *Drake* for R.N.B.; and G. F. Jones to *Pembroke* for R.N.B.

Surg. Sub-Lt. L. S. Anderson to be Surg. Lt.

Surg. Lt.-Comdr. W. T. R. Chapman to *Caledonia*.

ROYAL ARMY MEDICAL CORPS

Maj. A. G. Harsant, O.B.E., is secd. for serv. under the Foreign Office.

Short Service Commissions: Lt. J. F. Wilson to be Capt.

Lts. (on prob.) restd. to the estabt.: F. T. Moore, and is confirmed in his rank; and R. A. Smart.

SUPPLEMENTARY RESERVE OF OFFICERS

To be Lts.: Lt. E. H. Travers, from R.A., T.A. Res. of Off.; and D. M. I. Harmar.

ARMY DENTAL CORPS

Maj. A. E. Webb, having attained the age for retirement, is placed on ret. pay.

Short Service Commission: Lt. A. E. Allan to be Capt.

TERRITORIAL ARMY

Lts. A. H. L. Baker and C. H. G. Price to be Capts.

Second Lt. S. H. Heard, from 5th Bt. R.W.K., to be Lt.

P. J. O'Connell and M. I. Silverton to be Lts.

G. D. Kelly (late Cadet Serjt., Durham Sch. Contgt., Jun. Div., O.T.C.) to be Lt.

John MacMillan (late Offr. Cadet, Aberdeen Univ. Contgt. (Med. Unit), Sen. Div., O.T.C.) to be Lt.

TERRITORIAL ARMY RESERVE OF OFFICERS

Maj. A. O. Bekenn, from Active List, to be Maj.

ROYAL AIR FORCE

Wing Comdr. G. P. O'Connell to R.A.F. Depôt, Uxbridge, for duty as Medical Officer.

Dental Branch.—Flying Offr. H. B. Shay ceases to be seconded to Guy's Hospital.

Flying Offr. L. C. Bellsham-Revell is promoted to the rank of Flight Lt.

AUXILIARY AIR FORCE

No. 502 (Ulster) (Bomber) Squadron: C. W. Kidd is granted a commission as Flying Offr.

No. 605 (County of Warwick) (Bomber) Squadron: Flight Lt. J. S. Jerome, M.C., relinquishes his commission on completion of service and is permitted to retain his rank.

INDIAN MEDICAL SERVICE

Col. A. A. McNeight, V.H.S., retires.

Lts. (on prob.) to be Capts. (on prob.): M. C. L. Smith, B. M. Wheeler, C. H. Bliss, A. M. McGavin, J. D. O'Shaughnessy, J. E. O'Donnell, D. R. Cattanach, W. J. Young, and A. H. W. Mitchell.

Indian Medical Department.—Lt. (Sen. Asst. Surg.) A. L. Hudson to be Capt. (Sen. Asst. Surg.). Asst. Surg. (1st Cl.) E. A. Cotton to be Lt. (Sen. Asst. Surg.).

DEATHS IN THE SERVICES

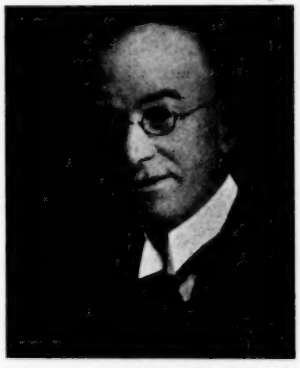
Lt.-Col. CHARLES WILLIAM HENRY WHITESTONE, who died on August 23rd at Charmouth, was born at Waterford in 1864, the youngest son of Mr. B. E. Whitestone of Dublin. He was educated at Trinity College, qualifying in 1887, and holding a house surgeoncy at Sir P. Dun's Hospital. Entering the R.A.M.C. he served in the Tirah campaign and elsewhere in the North West Frontier, India (1897–98), and in the South African war (1899–1902), where he was awarded the King's and Queen's medals. In 1913 he became lieut.-colonel and in the following year was present at the retreat from Mons when he won the medal and clasp.

Lt.-Col. GEORGE THOMAS LANGRIDGE, who died at Bournemouth on August 28th, was born at Bath in May, 1849. He qualified from St. Bartholomew's Hospital in 1871 and won the Herbert prize at Netley. Two years later he was commissioned surgeon in the Army Medical Department just at the time when medical officers (with the exception of those belonging to the household troops) ceased to be regimental officers. He served in the Afghan War (1878–80), took part in the capture of Kabul and two expeditions to Maidan, being awarded the medal with two clasps. He also served in the Transvaal campaign in 1881 and with the Natal field force. He retired in August, 1899.

OBITUARY

DAVID CONNOR KIRKHOPE, M.D. Glasg., D.P.H.

Dr. Kirkhope died on August 25th, three months after his retirement from the post of medical officer of health for Tottenham which he had held for 24 years. He was educated at Queen's University, Belfast, and went on to Glasgow where he qualified in 1895 and became resident assistant at the Western Infirmary. He then returned for a time to Belfast as honorary assistant pathologist at Queen's. After being called to the bar at Gray's Inn and the Middle Temple he took his M.D. in 1906 and the D.P.H. in the next year, and was appointed assistant M.O.H. to Leyton. In 1913 he followed J. F. Butler-Hogan as M.O.H. and school medical officer to the Tottenham urban district council, as it then was. His predecessor had been deeply interested in the housing of the working classes, and Kirkhope succeeded to this interest. And combining as he did the qualities of professional ability, leadership, and organising genius he became an outstanding health officer in a period which saw the birth of the school medical and child welfare services, and was instrumental in raising his department to a primary place in local government affairs. A cultured and talented man, always ready to give practical assistance and advice, Kirkhope leaves a memory of work worthily and efficiently done. There was abundant testimony to this effect at the time of his retirement under the age limit in May.



[Photograph by Elliott & Fry

DR. KIRKHOPE

GEORGE EDWARD LOVEDAY, M.B. Camb.

Dr. Loveday, who met his death by drowning on August 25th when on holiday in Norfolk, had been director of the clinical laboratories at Manchester Royal Infirmary for more than 30 years. Educated at Giggleswick School and Caius College, Cambridge, he took the natural sciences tripos in 1898 and stayed a further year to work at pathology. He went on for his clinical work to St. Bartholomew's Hospital, from which he qualified in 1902, and then returned to Cambridge to be house surgeon at Addenbrooke's Hospital. After another resident appointment at the Salop Infirmary he worked for a year in Sir Almroth Wright's institute at St. Mary's Hospital and came under the spell of laboratory methods for detecting disease and assessing its progress. His call to Manchester in 1906 to direct the clinical laboratory of the old infirmary in Market-street was the direct outcome of this interest, and in association with Ramsbottom and others he did a number of investigations on phagocyte-stimulating substances in the blood and later became reader in pathology at the university. During the war he was attached to the 57th General Hospital, first in Manchester and then in France. Soon after his return he got together a panel of rugby footballers to act as blood donors, thus forming the nucleus of the present voluntary transfusion service used by Manchester and Salford hospitals. Some years ago he drew up plans for the new department of clinical pathology which was opened in 1931 and is one of the best equipped of its kind in the country. His early work in vaccine therapy ultimately resulted in a large inoculation department at the infirmary, and in an extensive consulting practice outside. Loveday himself continually inaugurated and supervised the innumerable new methods of laboratory diagnosis and treatment as they came into use, and retained an expert and up-to-date knowledge of the many divergent fields. The work became a heavy strain, and the loss of his 15-year-old son from meningitis was a blow whose effects on him were apparent to his colleagues. One of them writes:

"Loveday's only ambition was to give to the patient of the moment the best and latest that practical pathology, bacteriology, and chemistry could provide; it was this narrowness of output that made his reputation essentially local. A real master of technique, he was the originator of applied pathology in Manchester; his colleagues relied implicitly on his opinions and on his reports. He created a great department and then hid himself behind it. The pathological service became so good that the calls on it repeatedly overwhelmed it; he satisfied the demands and then grumbled—such was his nature. Intensely shy, lacking in self-confidence, a little querulous, always hiding his light, he just missed doing really great things. But he did unknown good for his generation of local people."

Dr. Loveday, who was in his 61st year, leaves a widow with a daughter and a second son.

HENRY ALLCROFT DUFFETT, F.R.C.S. Eng.

Mr. H. A. Duffett died on August 26th at Sidcup where he had spent his whole professional life. Qualifying from Guy's in 1894, he held a series of resident appointments there and took his fellowship before settling in Sidcup as surgeon to the cottage hospital. In the meantime he had been a voyage on the steamship *Gaspesia*. He had opportunities for surgery of which he freely availed himself and contributed notes on interesting cases to our own columns. Later on he became medical officer to the Sidcup residential schools. He was also certifying factory surgeon and surgeon to the R division of the Metropolitan Police.

SIR GEORGE POLLARD, M.D. Edin.

Sir George Herbert Pollard who died at Southport on August 27th, aged nearly 73, was well known in public life. Son of James Pollard of Southport, he was an Edinburgh student of singular brilliance, gaining honours at the College of Surgeons in every subject of the medical curriculum. After taking his medical degree in Edinburgh he stayed on to assist the professor of midwifery there and began to read for the bar. Soon after settling in Southport he was called to the bar at the Inner Temple and became a justice of the peace for the borough and a member of the Lancashire county council. In 1896 he was selected as mayor of Southport for Queen Victoria's diamond jubilee, and a few years later contested the

Southport division unsuccessfully as a Liberal. After another plucky but unsuccessful attempt in the Radcliffe division he won the Eccles division of Lancashire and sat in the House of Commons from 1906 to 1918. During the war he was on the medical board of the Ministry of Munitions and advised the Ministry on poison gas and chemical warfare. In his early days in practice he took keen interest in diseases of the skin and was on the council of the London Dermatological Society. Later he served as vice-president of the industrial section of the Royal Institute of Public Health. He was knighted in 1909.

PUBLIC HEALTH

Food Poisoning in North London

AN outbreak of food poisoning in North London has affected over 100 persons. At the time of going to press Finsbury reports some 80 cases with 2 deaths; St. Pancras between 30–35 with 1 death; Islington, 7; and Bethnal Green, 1. Some 12–24 hours seem to elapse after infection before symptoms develop and then the patient complains of abdominal pains and nausea, and develops pyrexia, diarrhœa, and vomiting. Children and adults have both been affected. The poisoning has been traced to a Gaertner bacillus of the salmonella group. This organism has been isolated from some of the people affected and also in some cooked gammon sold by a shop in Finsbury. Corned beef and breakfast sausage were also suspected, and the organism has now been isolated from these articles. We are informed that no fresh cases have been infected since Wednesday, August 25th. A human carrier is suspect: one of the persons who handled the food is harbouring the organism, though he is at present in perfect health and cannot recall having had even a trifling indisposition. Two further carriers working in the shop have now been discovered. Their association with the sale of foodstuffs has, of course, been stopped.

INFECTIOUS DISEASE

IN ENGLAND AND WALES DURING THE WEEK ENDED AUGUST 21ST, 1937

Notifications.—The following cases of infectious disease were notified during the week: Small-pox, 0; scarlet fever, 1187; diphtheria, 832; enteric fever, 52; pneumonia (primary or influenzal), 391; puerperal fever, 40; puerperal pyrexia, 162; cerebro-spinal fever, 19; acute poliomyelitis, 23; acute polio-encephalitis, 3; encephalitis lethargica, 2; dysentery, 20; ophthalmia neonatorum, 120. No case of cholera, plague, or typhus fever was notified during the week.

The number of cases in the Infectious Hospitals of the London County Council on August 27th was 2635, which included: Scarlet fever, 567; diphtheria, 630 (diphtheria carriers, 26); measles, 167; whooping-cough, 473; puerperal fever, 19 mothers (plus 7 babies); encephalitis lethargica, 284; poliomyelitis, 9. At St. Margaret's Hospital there were 26 babies (plus 11 mothers) with ophthalmia neonatorum.

Deaths.—In 124 great towns, including London, there was no death from small-pox, 1 (0) from enteric fever, 5 (0) from measles, 3 (0) from scarlet fever, 16 (8) from whooping-cough, 23 (5) from diphtheria, 53 (14) from diarrhœa and enteritis under two years, and 9 (2) from influenza. The figures in parentheses are those for London itself.

Manchester reported the only death from enteric fever. Manchester and Newport each had two deaths from whooping-cough. Diphtheria was fatal in 11 great towns; in 3 cases each at Burnley, Liverpool, and Newcastle-under-Lyme. Manchester had 4 deaths from diphtheria, no other great town more than 2.

The number of stillbirths notified during the week was 257 (corresponding to a rate of 35 per 1000 total births), including 31 in London.

MEDICAL NEWS

Society of Apothecaries of London

At recent examinations the following candidates were successful:—

Surgery.—J. B. Alexander, Westminster Hosp.; F. Bastawros, Royal Colleges, Edin.; J. D. Buckner, Guy's Hosp.; I. W. Claiman, Univ. of Manch.; T. Gadian, Univs. of Oxf. and Manch.; J. B. Good and W. A. Groom, Guy's Hosp.; E. de C. Kite, Univ. of Glasg.; B. W. S. Spurgin, Univ. of Manch.; A. T. Rogers, St. Mary's Hosp.; and W. E. Young, Guy's Hosp.

Medicine.—A. A. Beazeley, Guy's Hosp.; T. Gadian, Univs. of Oxf. and Manch.; O. D. Gilmore, Univ. of Camb. and Westminster Hosp.; H. W. John, St. Mary's and West London Hosps.; K. G. Pascall, Guy's Hosp.; and T. van der Walt, London Hosp.

Forensic Medicine.—A. A. Beazeley, Guy's Hosp.; T. Gadian, Univs. of Oxf. and Manch.; O. D. Gilmore, Univ. of Camb. and Westminster Hosp.; B. T. Jones, St. Mary's and West London Hosps.; K. G. Pascall, Guy's Hosp.; and T. van der Walt, London Hosp.

Midwifery.—H. P. Anderson, Charing Cross Hosp.; A. Backman, Guy's Hosp.; J. A. W. Berryman, Charing Cross Hosp.; H. B. O. Cardew, Guy's Hosp.; D. H. Fowler, Middlesex Hosp.; M. W. Hemans, Univ. of Oxf. and St. George's Hosp.; D. C. Light, Guy's Hosp.; G. MacBain, Univ. of Sheff.; and T. van der Walt, London Hosp.

The following candidates, having completed the final examination, are granted the diploma of the society entitling them to practise medicine, surgery, and midwifery: A. A. Beazeley, I. W. Claiman, O. D. Gilmore, H. W. John, E. de C. Kite, K. G. Pascall, and T. van der Walt.

Sanitary Inspectors' Association

The jubilee conference of this association is being held in Brighton this week. The presidential address was given by Sir Leonard Hill, F.R.S., on Tuesday, and Major H. Stuart Blackmore, M.R.C.S., is speaking to-day (Friday) on air-raid precautions and the public health services.

Westminster Hospital

Applications are invited for the Wander scholarship in diseases of children. The scholar, who receives a salary of £250 per annum, acts as clinical pathologist and registrar to the children's department of the hospital. Further information will be found in our advertisement columns.

Colonel DONALD CLEWER, L.D.S. R.C.S., inspector of Army Dental Services in India, has been selected for appointment as director of Army Dental Services at the War Office, in succession to the late Colonel J. V. M. Byrne.

HOLIDAYS FOR WORKING WOMEN

THE following letter reaches us from the Factory Girls' Country Holiday Fund: "Will you allow us to make to your readers an urgent appeal for this fund? It has helped hundreds of the poorest of London's girls and women to go away for the August Bank Holiday week, the only clear week they could get in the whole year. Many more are hoping to get away during the next weeks; but at present our funds are exhausted. A large number of the girls sent away are hardly more than big, growing children, having recently left school for work in factories and warehouses. This summer holiday means even more than a health-giving change of air and surroundings. Boarded with kindly cottagers living in their own well-ordered little houses, the girls and women exchange with country folk experiences which make life fuller and more complete. Those from London gain, too, a new interest in nature—in the cultivation of flowers, and fruit, and vegetables, and in the care of animals. Think what this means to people who live for the rest of the year in crowded dwellings and stuffy streets, often far away from parks and large open spaces! A summer holiday means much to most of us. To them it means a benefit which is almost indescribable. Will your readers help us to save these girls from bitter disappointment. Gifts will be thankfully received and acknowledged by the hon. treasurer, Mrs. Slater, Lowood, Hindhead, Surrey, or by Miss Canney, 75, Lamb's Conduit-street, London, W.C.1."

The appeal is signed by the Countess of Sandwich, Miss Lilian Braithwaite, Miss May Wynne, Miss Mary Paget, the Bishop of London, the Chief Rabbi, and Lady Loch (chairman).

Medical Diary

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

UNIVERSITY OF GLASGOW.
TUESDAY, Sept. 7th.—4.30 P.M. (Tennent Memorial Building, Church-street), Prof. A. J. Ballantyne: Hypertension, Vascular Sclerosis, and Renal Disease.

BRITISH POSTGRADUATE MEDICAL SCHOOL, Ducane-road, W.
WEDNESDAY, Sept. 8th.—3 P.M., Prof. Max Thorek: Tubo-valvular Gastrostomy. Clinical and pathological conference (surgical).
THURSDAY.—3 P.M., operative obstetrics.
Daily, 10 A.M. to 4 P.M., medical clinics, surgical clinics and operations, obstetrical and gynæcological clinics and operations.

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, W.
MONDAY, Sept. 6th, to SATURDAY, Sept. 11th.—BROMPTON HOSPITAL, S.W. M.R.C.P. course in chest diseases. 5 P.M. twice weekly.—NATIONAL TEMPERANCE HOSPITAL, Hampstead-road, N.W. Tues. and Thurs., 8 P.M., clinical and pathological course for M.R.C.P. candidates.—MIDDLESEX HOSPITAL, W. Mon., Wed., and Fri., 5.30 P.M., primary F.R.C.S. course in physiology. —Courses are open only to members of the fellowship.

CENTRAL LONDON THROAT, NOSE, AND EAR HOSPITAL, Gray's Inn-road, W.C.
MONDAY, Sept. 6th, to FRIDAY, Sept. 10th.—4.30 P.M., course in methods of examination and diagnosis.

Vacancies

For further information refer to the advertisement columns

Aberdeen University.—Crombie-Ross Lectureship in Psychopathology, £650.
Birmingham City.—Asst. Res. M.O. for Tuber. Section of P.H. Dept., £400.
Birmingham, Erdington House.—Asst. Res. M.O., £300.
Birmingham, Little Bromwich Hosp. for Infectious Diseases.—Two Jun. Res. M.O.'s, each £300.
Birmingham Royal Cripples Hosp.—Res. H.S., at rate of £200.
Birmingham, St. Chad's Hosp.—H.S., at rate of £150.
Blackburn, Queen's Park Hosp. and Institution.—Res. Jun. Asst. M.O., at rate of £150.
Bolingbroke Hosp., Wandsworth Common, S.W.—Res. Surg. O., £200.
Bradford Children's Hosp.—H.P., £150.
Brighton, New Sussex Hosp. for Women, Windlesham-road.—Hon. Surgeon.
British Postgraduate Medical School, Hammersmith.—Three H.S.'s for Surgical Unit, each at rate of £105.
Burnley, Victoria Hosp.—H.S., at rate of £150.
Buxton Clinic for Rheumatism and Allied Diseases.—H.P., at rate of £150–£200.
Canterbury, New Kent and Canterbury Hosp.—H.S. to Special Depts., at rate of £125.
Cardiff, King Edward VII Welsh National Memorial Association. Asst. Res. M.O.'s to North Wales Sanatorium and Glan Ely Hosp., each £200.
Cardiff, Prince of Wales' Orthopædic Hosp.—H.S., at rate of £200.
Central London Ophthalmic Hosp., Judd-street, W.C.—Asst. Surgeon. Also Pathologist, £105.
Central London Throat, Nose and Ear Hosp., Gray's Inn-road, W.C.—Third Res. H.S., at rate of £75.
Cheshire Joint Sanatorium.—Third Asst. M.O., £250.
Chester, Clatterbridge (County) General Hosp.—Med. Supt., £1000. Also Jun. Res. Asst. M.O., at rate of £200.
Chester Royal Infirmary.—H.S., £150.
City of London Maternity Hosp., City-road, E.C.—Asst. Res. Officer, at rate of £100.
Colchester, Royal Eastern Counties Institution, &c.—Asst. M.O., £400.
Derbyshire Royal Infirmary.—H.P., £150.
Dreadnought Hosp., Greenwich, S.E.—Receiving Room Officer, at rate of £200.
Durham County Hosp.—H.S., at rate of £150.
Ealing, King Edward Memorial Hosp.—Reg. M.O. and Cas. H.S., at rate of £275 and £150 respectively.
Elizabeth Garrett Anderson Hosp., Euston-road, W.—Third H.S., at rate of £50.
Exeter, Princess Elizabeth Orthopædic Hosp.—Res. H.S., at rate of £150.
Exeter, Royal Devon and Exeter Hosp.—H.S., at rate of £150.
General Post Office.—Two Asst. M.O.'s for Headquarters Medical Branch, each £500.
Gravesend and North Kent Hosp.—Jun. H.S. and Cas H.S., £120 and £130 respectively.
Great Yarmouth General Hosp.—H.S., at rate of £140.
Guildford, Royal Surrey County Hosp.—H.S., at rate of £150.
Herefordshire General Hosp.—H.S. for Cas. and Ear, Nose, and Throat Dept., £100.
His Majesty's Colonial Service.—Asst. Med. Supt. for Central Mental Hosp. in the Malay States, £840.
Hosp. for Sick Children, Great Ormond-street, W.C.—Res. Surg. O., £200. Also Res. H.P. and Res. H.S., each at rate of £100.
Hosp. for Women, Soho-square, W.—Hon. Cons. Phys. to Inpatient Dept.
Hove General Hosp.—Jun. Res. M.O., £120.
Ipswich County Borough.—Asst. M.O.H. and School M.O., £600.
Ipswich, East Suffolk and Ipswich Hosp.—H.S., £144.
Kent County Public Health Dept.—Asst. Tuber. O., £600.
Liphook, Hants, King George's Sanatorium for Sailors.—Asst. M.O., at rate of £200.
Liverpool Royal Children's Hosp.—Res. M.O. and Res. Surg. O. for Heswall Branch, each at rate of £120.
Lochgilphead, Argyll and Bute District Mental Hosp.—Res. Asst. M.O., £300.
London County Council.—Infectious Hosps.: Asst. M.O.'s, Grades 1 and 2, £350 and £250 respectively.
London County Council.—Two Part-time Obstetricians and Gynæcologists, £800 and £600. Asst. Pathologist, £650. Also Asst. M.O., £470.
Manchester, Ancoats Hosp.—H.S., at rate of £100. Also Asst. Pathologist, £300–£350.
Manchester Ear Hosp., Grosvenor-square, All Saints.—Res. H.S., £120.
Manchester, Prestwich Mental Hosp.—Locum Tenent M.O., £7 7s. weekly.
Manchester Royal Infirmary.—Res. Cas. O., £150.
Manchester, St. Mary's Hosp.—H.S.'s to Special Depts., each at rate of £50.
Manor House Hosp., Golders Green, N.W.—Jun. M.O., £200.
Merthyr Tydfil County Borough.—Asst. M.O.H. and Asst. School M.O., £500.
Middlesbrough, Holgate Municipal Hosp.—Asst. Res. M.O., £270.
National Temperance Hosp., Hampstead-road, N.W.—Cas. O., at rate of £120. Also Hon. Dermatologist.
Newcastle General Hosp.—Surg. Reg., £250.
Northampton General Hosp.—Sen. Res. M.O., £250. Also H.P.'s, H.S.'s, and Cas. O., each at rate of £150.
Nottingham General Hosp.—H.P., at rate of £150.
Otago University and Dunedin Hosp., N.Z.—Res. M.O., £500.
Pembroke County War Memorial Hosp., Haverfordwest.—Res. H.S., £200.
Plymouth, Prince of Wales's Hosp., Greenbank-road.—H.S., at rate of £120.
Preston and County of Lancaster Royal Infirmary.—H.S. to Eye, Ear, Nose, and Throat Dept., £150.
Princess Beatrice Hosp., Earl's Court, S.W.—Hon. Asst. Obstet. Phys. and Gynæcologist. Res. Surg. O., at rate of £200. H.P. and Cas. O., and Cas O. and Obstet. H.S., each at rate of £110.
Princess Louise Kensington Hosp. for Children, St. Quintin-avenue, W.—H.P., at rate of £120–£150.
Reading, Royal Berkshire Hosp.—R.M.O. to Blagrave Branch, at rate of £150.
Richmond Royal Hosp., Surrey.—Res. M.O., £200., Sen. H.S., £150. Also Jun. H.S., £100.
Rotherham Hosp.—Sen. H.S., £200. Also H.S. for Ophth. and Ear, Nose, and Throat Depts., £150.
Royal Army Medical Corps.—Commissions.
Royal Cancer Hosp., Fulham-road, S.W.—Asst. Radium Therapist, £500.
Royal Free Hosp., Gray's Inn-road, W.C.—Res. Cas. O., at rate of £150.
Royal National Orthopædic Hosp.—Two H.S.'s, each at rate of £250.
Royal Northern Hosp., Holloway, N.—H.S., at rate of £70.
Ryde, Royal Isle of Wight County Hosp.—Hon. Surgeon to Ear, Nose, and Throat Dept.
St. Albans County Institution, Oster House.—H.S., £175.
St. Bartholomew's Hosp., E.C.—Ophth. Surgeon.
St. Leonards-on-Sea, Buchanan Hosp.—H.S., £125.
St. Mary's Hosp. for Women and Children, Plaistow, E.—Hon. Dermatologist.
St. Peter's Hosp. for Stone, &c., Henrietta-street, W.C.—H.S., at rate of £75.
Salford Royal Hosp.—H.P., two H.S.'s, and Cas. H.S., each at rate of £125.
Sheffield Royal Hosp.—Sen. Cas. O., £150.
Sheffield Royal Infirmary.—Sen. Cas O., at rate of £150.
Sheffield University.—Asst. Pathologist to Hospital and Demonstrator of Pathology to University, £500.
Southampton, Royal South Hants and Southampton Hosp.—Res. Anæsthetist and H.S. to Ear, Nose, and Throat Dept., at rate of £150.
Southend-on-Sea General Hosp.—H.P., at rate of £100.
Stoke-on-Trent, North Staffordshire Royal Infirmary.—Three H.S.'s to Special Depts., each at rate of £150.
Surrey County Council.—Two Asst. M.O.'s, each £600.
Swansea General and Eye Hosp.—Locum H.S. to E.N.T. and Ophth. Depts., 5 guineas weekly.
Taunton and Somerset Hosp.—Two Hon. Asst. Surgeons.
Tunbridge Wells, Kent and Sussex Hosp.—H.S. to Ear, Nose, and Throat Dept., £150.
Walsall General Hosp.—H.S., at rate of £150.
Warrington Infirmary and Dispensary.—Third Resident, at rate of £150.
West London Hosp., Hammersmith, W.—H.P., H.S., H.S. with Throat, Nose, and Ear duties, and Res. Anæsthetist, each at rate of £100.
Westminster Hosp., Broad Sanctuary, S.W.—Wander Scholarship, £250.
Westmorland County Hosp., Kendal.—H.S., at rate of £200.
Wigan, Royal Albert Edward Infirmary and Dispensary.—Res. Med. and Surg. O. and Reg., £250.
Willesden General Hosp., Harlesden-road, N.W.—Cas. O., at rate of £100.
Wolverhampton Royal Hosp.—H.P., at rate of £125.
Woolwich and District War Memorial Hosp., Shooters Hill, S.E.—Res. Surg. O., £175.
Worcestershire County Council—Asst. Tuber. O., £600.
Wrexham and East Denbighshire War Memorial Hosp.—Res. H.S. for Spec. Depts., at rate of £150.
York Dispensary.—Res. M.O., £175.

The Chief Inspector of Factories announces vacancies for Certifying Factory Surgeons at Whitstable (Kent), Stokesley (Yorks, N. Riding), and Elland (Yorks, W. Riding). (Latest date for receipt of applications of all, Sept. 10th.)

The Chief Inspector of Factories announces a vacancy for a Certifying Factory Surgeon at Normanton (York, W. Riding). (Application before Sept. 14th.)

NOTES, COMMENTS, AND ABSTRACTS

THE MADRID BLOOD TRANSFUSION INSTITUTE

By R. S. Saxton, M.R.C.S. Eng.
MEMBER OF THE BRITISH AMBULANCE UNIT IN SPAIN

The Sanidad Militar of the Spanish Republic has organised a blood transfusion institute in Madrid. Its work is to supply the personnel to give transfusions—collecting stores of blood and organising a service of donors—at the request of the city's hospitals and of the casualty stations on the Madrid front. The present rate of supply is about 400 litres of preserved blood per month, and is rapidly increasing. As many as 100 transfusions have been given in one day.

The personnel, whose time is devoted exclusively to the institute, consists of 5 doctors, 5 nurses, 5 members of the secretariat (interpreters, &c.), and the domestic staff.

The donors are all volunteers. They are paid nothing, but are given certain facilities for obtaining good food. They are recruited from either sex, between the ages of 18 and 50. Particulars are taken, for statistical and record purposes, of the age; name; sex; whether married or single; place of birth; nationality of parents; number of living and of dead children; hereditary diseases; other diseases, especially syphilis and malaria; colour of skin and iris; quantity and colour of hair. After signing a document stating that the donor has never had syphilis or malaria, he is grouped, and a sample of blood is taken for serological tests for syphilis. For simplicity only Groups II and IV (Moss) are used. In practice the other groups are not necessary, and their infrequency would lead to much waste of blood, since it would often be stored for over 3 weeks. Some 80 per cent. of the population are included in Groups II and IV. Observations are made on the state of the veins, from the point of view of transfusion, and of the weight and height of the donor. It is hoped later to estimate the hæmoglobin percentage before and after extractions, and also the cellular content of the blood. Those who have had syphilis or malaria, or are in poor general health, are rejected. An institution is recommended for the treatment of any disease discovered. If satisfactory the donors are given cards stating that they are in the service of the institute. They are then liable to be called upon to give usually 500 c.cm. of blood not more than once every three weeks. There are at present about 800 donors on the books and some 20 more are added each day.

After each extraction the donor receives a certificate and a permit to purchase extra foodstuffs. He rests for ten minutes, and is given a cup of coffee and a present of a small quantity of food, such as a packet of rice and a tin of condensed milk. The permit for foodstuffs covers 8 days' supply of eggs, meat, milk, and vegetables.

All blood at present supplied by the Madrid institute is taken from the civil population of the city. Hospitals may, and ours does, organise a service of direct donors to use when supplies fail or if otherwise indicated. I personally have a list of 50 members of the staff grouped and tested for syphilis by serological tests. Donors are summoned by telephone if available; if not, by post card. They are selected so that any one donor is not used excessively and so as to supply rather more of Group IV than of Group II in order that in great emergencies grouping of the patient may be dispensed with.

PREPARATION

Citrate solution.—A prepared packet of 30 g. of sodium citrate powder is placed in a flask with 788 c.cm. of distilled water. This is gently heated and agitated until dissolved, forming a 3·8 per cent. solution. The solution is then filtered through glass wool using a water-suction pump, and placed in 50 c.cm. bottles with cotton-wool bungs.

For sterilisation the cotton-wool is replaced by a paper cap, and the bottle placed in the autoclave. Rubber bungs are separately sterilised and inserted later if required for transport or other purposes.

Sterilisation.—Bottles, glassware, bungs, &c., are washed in water, and dried at 110° C. in an oven. The small articles, such as bungs, having been wrapped in towels, are then placed together with the bottles of citrate in an autoclave. The steam pressure is raised to 15 atmospheres and then released. Needles, trocars and cannulas, adaptors, &c., are kept in alcohol, and rubber tubing is sterilised by boiling.

Apparatus.—The material necessary for the withdrawal of blood consists of, first: alcohol; a light rubber tourniquet; a glass connexion tube with air trap; and a vacuum pump—usually a small hand pump is used; water suction has been tried and is not favoured by the majority of the operators. Then the following are all sterile: large and small intravenous needles; trocars and cannulas; adaptors; rubber tubing; towels, gauze, and cotton-wool; a 500 c.cm. wide-necked bottle with paper cap; 2 rubber bungs for the above, one with 2 perforations containing short glass tubes; and a 50 c.cm. bottle containing 3·8 per cent. sodium citrate solution.

WITHDRAWAL OF BLOOD

The donor lies on a table fitted with an arm-piece on each side.

Under the chosen arm, usually the right, is placed a sterile towel over american cloth. A sterile towel is laid on a table beside the arm, and on it are placed the sterile requirements as listed above, except for the needles, &c., kept in a glass container in alcohol. The tourniquet is placed on the arm and the antecubital region cleaned up with alcohol. The operator fits together the tube with the vacuum pump and the air trap, which is used to prevent blood getting into the pump. A needle of suitable size, connected to the bottle by rubber tubing, is introduced into the bottle of citrate, and about 40 c.cm. sucked through by the nurse operating the pump. The citrate is shaken all round the bottle where drops of blood may spurt.

The needle is then introduced directly into the donor's vein while the nurse continues to operate the vacuum pump, and while the donor clenches and unclenches his fist. Should the pump cause too low a pressure the vein collapses and the flow of blood is impeded. The bottle is gently agitated to mix the blood with the citrate and a steady flow of blood maintained. When 500 c.cm. has been extracted the tourniquet is removed, the needle removed in the usual manner and used to suck up the remaining 10 c.cm. of citrate. The wound in the arm is cleaned and covered with adhesive plaster, and the donor dealt with as previously stated.

The rubber bung is then changed, and the bottle well shaken and labelled with the donor's number, with the date, and the quantity of blood, its Moss and international group. The blood is then stored in a refrigerator at 1° C. It may be thus preserved up to three weeks, but individual cases vary widely; some, badly laked after two days, being useless. The cause of this has not yet been investigated.

THE TRANSFUSION

The following is a description of the method of blood transfusions administered by a member of the British medical unit on the Madrid front. The patients are normally given 500 c.cm. of citrated blood; Groups I and II receiving Group II, and Groups III and IV Group IV. Direct transfusions of smaller

quantities of uncitrated blood, about 300 c.cm., are given to a smaller number of patients, usually using the same blood group.

Besides blood, the patients—war casualties—often received some of the following :—

Intravenously.—For poor or absent radial pulse : 200–800 c.cm. of 30 per cent. glucose with insulin (1 unit to 3 g. of glucose) ; 50–200 c.cm. of hypertonic saline.

For hæmorrhage : 0·5 g. of calcium chloride in 5 c.cm. saline following the transfusion, or in the last few c.cm. of the transfusion.

For poor heart action : 1 c.cm. of 1/1000 adrenaline in the blood.

For great thirst : 100–200 c.cm. of normal saline ; 100–400 c.cm. of isotonic glucose.

Subcutaneously.—For poor heart action or absent radial pulse : 1 c.cm. of 1/1000 adrenaline ; 5 c.cm. of 20 per cent. camphor in oil ; 2 c.cm. of Coramine.

For hæmorrhage : 5–100 c.cm. of Coaguleno ; 2 c.cm. of 5 per cent. ergotin.

RESULTS

The work was done in two periods, the first covering February, and the second July, 1937. In the first period no record was kept of about the first 20 cases, which do not figure in the statistics given below. In about half the cases the vein was exposed by dissection ; and the maximum number of transfusions I gave in one day, using only blood and none of the above-mentioned material, was 10. In the second period, the exposure of the vein, which wastes time and carries some risk of sepsis in a patient whose major wound will probably become septic, was reduced to between 5 per cent. and 10 per cent. of cases. The maximum number transfused in a day was 12, using the treatment mentioned above when indicated. The following figures were compiled from my own records of transfusions done during a period of 7 weeks. In all 99 patients received blood ; of these 61 died. More than one transfusion was given to 12 cases, of whom 11 died. Arm-to-arm transfusion was used when the supply of the appropriate group of citrated blood failed or when the patient had already received so much citrated blood that it was thought inadvisable to give him more citrate. The latter cases would be the more serious ones and amongst the 12 who received more than one transfusion. The method was used in 10 cases, 8 of whom died.

It can be seen that the mortality among transfused patients was a little over 60 per cent. At least 90 per cent. of the transfused cases were expected to die without the transfusion, so that the saving of a life in which blood transfusion may be considered to have been a necessity would amount to about 30 recorded cases, to which might be added some of the first 20 unrecorded ones.

The instruments usually employed for giving the blood are French—the Jube 10 c.cm. 2-way transfusion syringe for citrated blood, and the Henri-Jouvelet apparatus for arm-to-arm transfusion. Others have been tried and are used in the absence of these. With a sufficient quantity of good instruments future statistics would show an improvement in speed : the whole operation, from the moment of seeing the patient, in a favourable case, now only takes half an hour. But it is the cleaning and sterilising of the small set of instruments that wastes a great deal of time that could be saved if spare sets were always at hand while the first were being cleaned. The Spanish Medical Aid Committee (24, New Oxford-street, London, W.C.) furnishes what it can, considering the tremendous calls for material and personnel with which it has to deal, but with further support it would be able to supply this need.

For the improvement of the fatality-rate it is convenient to consider the patients that died in two categories. The first were unsuitable for transfusion, though at the time it was considered by some surgeons that such a transfusion offered the only remaining hope of saving the life. These patients suffered from toxæmia from a severe infection, and it was decided that they should no longer receive citrated blood, because among some dozen cases all died save one, who was in no immediate danger. In the other category are the cases of very severe shock, who probably could be saved in the majority of cases with large and repeated transfusions of blood, a treatment not practicable under prevailing circumstances because the supply of donors is limited. Several of these cases recovered from a condition in which they had stopped breathing. They received artificial respiration at the same time as the transfusion. After receiving a litre of blood and a litre of the fluids as enumerated above, they have not only spoken but have sat up and helped themselves to a drink or a cigarette. Later on these people have usually succumbed to the original condition for lack of further transfusion.

COMMENTS

The difficulties of giving large doses of blood are : First, that sodium citrate in doses of over 5 grammes is said to produce a toxic state resembling shock ; a litre of citrated blood contains nearly 4 grammes, so that it is not considered advisable to give much more than this amount. Secondly, one is reduced to direct donors in the present conditions obtaining in Spain. The choice of these is further limited in large transfusions to members of the same group, owing to the probability, otherwise, of reverse agglutination. For every litre of blood one would have to have at least two donors, and to obtain such a liberal supply of donors at the right time and place would be extremely difficult. In fact, in dealing with large numbers of patients this treatment is impracticable. The only possibility of saving these lives appears to rest with the use of stored cadaver blood as described by S. S. Yudin (*Lancet*, August 14th, p. 361). In my opinion it is the duty of the Sanidad Militar of the Spanish Republic to organise the large-scale supply of cadaver blood, which of course is readily available, to their front line hospitals in the same way as they now supply citrated blood.

EDUCATING THE PATIENT

PERHAPS in some future age when hygiene and physiology and the principles of preventive medicine are taught in every school, the doctor and his patient will at last see things from the same point of view, and those criticisms of the medical profession which are based on misunderstandings will disappear. In the meantime we must expect to be accused of callousness, of being ultra-conservative in our reception of new methods, of standing too much upon our dignity, and so on, and must not be too pained by the success of much-advertised patent remedies.

A good deal can be done to correct misunderstandings by medical men who write for the general reader, and, though not prepared with any such purpose, the eleven essays which Mr. Johnston Abraham has collected under the vocal-fremitus-producing title of "99, Wimpole Street" [1] provide a satisfactory introduction to the doctor's point of view. In the essay on the evolution of the doctor he contrives to compress into sixteen pages an account of the development of the medical man from

[1] 99, Wimpole Street. By J. Johnston Abraham. London : Chapman and Hall. 1937. Pp. 194. 5*s*.

the days when medicine was nine-tenths folk-lore to the present time when this fraction has been—well—considerably reduced. He records that a physician has always been a physician, whereas the surgeon has but recently been emancipated from barbering, and that the general practitioner is the direct descendant of the apothecary who, from being a mere dispenser for the physician, acquired legal permission to practise medicine by an Act of 1815. In "Harley Street" he explains the mystery of how and why this address has attained to its present eminence, and what really constitutes a specialist and a consultant. In other essays he reviews such varied subjects as the reasons for the frequent changes in female fashions, the best places to go if you want a sunny holiday, the gradual conquering of "incurable" diseases, the incredible ignorance of medical matters displayed by the average novelist, and the fear of death, and all, even the last, with a cheerful enthusiasm which infects the reader. It is a book which the doctor will do well to lend to his patient, and if, as is probable, it will never be returned, he may console himself with the assurance that he will have a more understanding patient thereafter.

TREATMENT OF ANTERIOR POLIOMYELITIS

THE outbreak of anterior poliomyelitis in Melbourne is apparently serious. In the *Times* of August 30th the cases are said to number 185, with 13 deaths. The fact that a public appeal has been opened for funds for the after-care of patients, to supplement a State grant of £10,000, focuses attention on the method of treating paralysis attributable to this cause which has emanated from Australia.

Any methods for which good results are claimed in the restoration of function of paralysed muscle deserve critical study. Those outlined by Sister Kenny[1] dispense with splinting and include the maintenance of an optimistic outlook; they are indeed, apart from the abandonment of splints, similar to those in general use. It is the evidence submitted for their value that we find disappointing. No accurate record is supplied of the degree of paralysis and the degree of recovery of individual muscles, and there are no muscle charts. Functional recovery, with all the possibilities of the substitution of non-paralysed for paralysed muscle action, is no guide to the degree of recovery of paralysed muscle. The most interesting statement is that a return of power was noted after 4 months' treatment in muscles showing no power of contraction after 2–10 years' treatment by other unspecified methods. Treatment mainly consists of early voluntary movement of the muscles affected (maintenance of impulse), graduated exercises, massage, and hydrotherapy. Patients of all ages are taught to retain a consciousness of the affected part. Early efforts are made to re-establish a reflex arc at the spinal level by local (peripheral) stimulation, massage, and active movements. Splinting and immobilisation is blamed for the failures of other systems of treatment, for trophic changes, and for failures of growth in the affected limb. In view of the fact that failures of growth are often more apparent when walking and weight-bearing are resumed and must be regarded as a deficient response to normal physiological stimulus, it would be interesting to know if they do not occur when no splints are used and when voluntary movement is encouraged as soon as the febrile period has terminated. No figures are given to substantiate the claim that growth will be promoted in the affected limb by the absence of retentive apparatus in the early stages of the illness. Sister Kenny and her medical collaborators are not only convinced that splinting is unnecessary but go so far as to attribute deformities to secondary changes in joints and bones induced by immobilisation. Anyone who has watched deformities in the making, the pull of the stronger antagonistic muscles and overstretching of paralysed muscle, will dissent from this view. Splinting need not be synonymous with immobilisation but by preventing overstretching it should surely assist recovery. Recumbency is a form of splinting which cannot be discarded without more convincing evidence than is here supplied that recovery will take place in its absence.

It is clear to anyone who reads Sister Kenny's book that she is a devoted and enthusiastic worker, and that she has in fact achieved good results in the treatment of both infantile paralysis and spastic diplegia. We understand that the Queensland Government has, following a favourable report on some cases examined by Mr. J. V. Guinane, given facilities for extending the work undertaken by Sister Kenny, and that 4 clinics treating 600 patients were already established at the time of writing this book, with 8 further clinics in the process of construction. Until the publication of the findings of the medical commissions officially appointed to investigate and report on the work done at these clinics judgment must be reserved.

[1] Infantile Paralysis and Cerebral Diplegia. By Sister Elizabeth Kenny. Foreword by Prof. H. J. Wilkinson, professor of anatomy and dean of the faculty of medicine, University of Queensland. Sydney and London: Angus and Robertson. 1937. Pp. 125. 21s.

Appointments

CLARK, O. P., L.R.C.S. Edin., Hon. Anæsthetist to the Brighton Provident Dental Hospital.

LIDDELL, V. L., M.B. Leeds, D.P.H., Assistant Medical Officer for Maternity and Child Welfare for Birmingham.

MILNE, G. P., M.B. Aberd., D.C.O.G., Gynæcological Registrar at Aberdeen Royal Infirmary.

WARE, C. E. M., M.R.C.S. Eng., Assistant Pathologist at the Dudley-road Hospital, Birmingham.

Certifying Surgeons under the Factory and Workshop Acts: Dr. M. MACCRIMMON (West Drayton District, Middlesex); Dr. T. J. S. O'NEILL (Shelf District, Yorks, W. Riding); Dr. I. G. WILLIAMS (Bethesda District, Caernarvon); and Dr. S. B. STOKER (Ossett District, York, W. Riding).

Births, Marriages, and Deaths

BIRTHS

CHAVASSE.—On August 24th, the wife of Dr. C. C. H. Chavasse, Maida Vale, W., of a daughter.

DE LABILLIÈRE.—On August 26th, at Gravesend, the wife of Surg. Lieut.-Comdr. C. D. D. de Labillière, R.N., of a son.

ELDRIDGE.—On August 22nd, at Holmlea, Lymm, Cheshire the wife of Dr. R. W. Eldridge, of a son.

HAYWARD.—On August 24th, at Chelmsford, the wife of Dr. Frank Hayward, of a son.

MARRIAGES

CAMPBELL—FULLER.—On August 21st, at Holy Trinity Church, Brompton, L. I. Seton Campbell, M.R.C.S. Eng., to Eileen Patricia, younger daughter of the late Captain W. B. Fuller, Queen's Royal Regt., and Mrs. Charles Carington, of Kingston Hill.

PARKER—TOWNEND.—On August 28th, at St. Martin-in-the-Fields, Surgeon Captain H. B. Parker, D.S.C., R.N., to Mrs. J. C. Townend, daughter of Mrs. McBean, of Liverpool and Inverness.

DEATHS

BRODIE.—On August 29th, William Brodie Brodie, M.D. Glasg., F.R.S. Edin., of Camden House, Bletchingley, Surrey, aged 66.

COWIE.—On August 26th, at Bournemouth, George Cowie, M.B. Aberd., for many years in practice at Wimbledon, aged 73.

DOWLING.—On August 20th, at Teignmouth Hospital, George William Dowling, M.R.C.S. Eng., of Shaldon, Devon, formerly of Alderley Edge, Cheshire.

DUFFETT.—On August 26th, at Sidcup, Henry Allcroft Duffett, F.R.C.S. Eng.

KIRKHOPE.—On August 25th, David Connor Kirkhope, M.D. Glasg., D.P.H., of Selborne-road, Southgate, N., late M.O.H. Tottenham, aged 65.

LANGRIDGE.—On August 28th, at Bournemouth, Lieut.-Col. George Thomas Langridge, late R.A.M.C., aged 88.

LOVEDAY.—On August 24th, at Sheringham, George Edward Loveday, M.B. Camb., of Fallowfield, Manchester.

POLLARD.—On August 27th, at Southport, Sir George Herbert Pollard, M.D. Edin., J.P., formerly M.P. for Eccles Division of Lancs.

STEEL.—On August 20th, at Leominster, Gerard Steel, L.S.A., J.P., aged 72.

WHITESTONE.—On August 23rd, at Charmouth, Charles William Henry Whitestone, M.B. Dubl., Lieut.-Col. R.A.M.C. (retd.), aged 71.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.